THE

ELECTRICAL REVIEW.

VOL. LXVI. JUNE 17, 1910. No. 1,699.

ELECTRICAL REVIEW.

Vol. LXVI.] CONTENTS: June 17, 1910. [No. 1,699.

	Page
The I.M.E.A. Convention	977
Tramway and Railway Statistics	978
The Sale of an Electrical Undertaking	978
Incorporated Municipal Electrical Association: Glasgow Convention	979
Commercial Advancement of Electric Supply	980
Notes on the Commercial Progress of Electricity Undertakings	982
Correspondence:— Packing for Abroad; The Prevention of Rust; The Calculation of Illumination; Printing Installations; The Election of Council of the I.E.E.; Inspection of Coal Mines; Free Trade or Protection; Localisation of Faults on Underground Mains (*illus.*); Technological Examinations; Electrical Fatalities in Mines; Tungsten Lamp Patents; I.E.E. Students' Annual Visit; Lightning Effects; Flame Arc Lamps—Carbon Deposit ...	985—989
Legal	989
New Electrical Devices, Fittings and Plant (*illus.*)	992
Parliamentary	992
Business Notes	993
Notes	1000
City Notes	1002
Stocks and Shares	1004
Electric Tramway and Railway Traffic Returns	1004
Share List of Electrical Companies	1005
Debate on the Effects of Free Trade or Protection upon the Electrical Industry (*concluded*)	1007
The Effects of Free Trade or Protection	1011
A Large Allen Engine for Melbourne (*illus.*)...	1013
The Tramway Congress	1014
Street Lighting: Electricity *v.* Gas	1015
Foreign and Colonial Tariffs on Electrical Goods	1015
New Patents Applied For, 1910...	1016
Published Specifications	1016
Contractors' Column ... Advertisement pages xxiv and xxvi	

THE ELECTRICAL REVIEW.

Published every FRIDAY, Price 4d.

The Oldest Weekly Electrical Paper. Established 1872.

TO BE OBTAINED BY ORDER FROM ANY NEWSAGENT IN TOWN OR COUNTRY.

OFFICE:—4, LUDGATE HILL, LONDON, E.C.

Telegraphic Address.: "AGEEKAY, LONDON." Code, A B C.

Telephone Nos.: Holborn 983; Central 4425 (Editorial only).

ALL Letters should be addressed to the Proprietors, H. Alabaster, Gatehouse & Co.

ADVERTISEMENT RATES ON APPLICATION.

The "Electrical Review" is the recognised medium of the Electrical Trades, and has

BY FAR THE LARGEST CIRCULATION

of any Electrical Industrial Paper in Great Britain.

SUBSCRIPTION RATES.—Per annum, postage inclusive, in Great Britain, 19s. 6d.; Canada, £1 1s. 8d. ($5.30). To all other countries, £1 10s.

BINDING.—Subscribers' numbers bound, including case, for 4s. each volume.

CASES.—Cloth Cases for Binding can be had, price 2s. 6d. each; post free 2s. 9d.

FOREIGN AGENTS. — New York: D. VAN NOSTRAND, 23, Murray Street. TORONTO, ONT.: WM. DAWSON & SONS, LTD., Manning Chambers. Paris: BOYVEAU & CHEVILLET, 22, Rue de la Banque. Berlin: ASHER & Co., Unter den Linden.

Cheques and Postal Orders (on Chief Office, London) to be made payable to Mr. H. ALABASTER, 4, Ludgate Hill, E.C.

THE

UNIVERSAL ELECTRICAL DIRECTORY

(J. A. BERLY'S).

1910 EDITION

H. ALABASTER, GATEHOUSE & CO.,

4 Ludgate Hill, London, E.C.

THE I.M.E.A. CONVENTION.

THE fifteenth annual Convention of the Incorporated Municipal Electrical Association has taken place under exceptionally favourable conditions; the weather, up to the time of writing, has been all that could be desired, the attendance satisfactory, and the scenery in the places visited world-famous for its beauty. The traditional hospitality of the great Scottish capitals of industry and learning needs no praise, and nothing was left undone towards the comfort of the visitors.

The presidential address of Mr. W. W. Lackie, who has so ably carried on the great industry established by his genial predecessor, Mr. W. A. Chamen, covers a wide field, and forms a convenient epitome of the topics in which municipa electrical men have been especially interested of late. Referring to the benefits derived from the municipalisation of electricity supply, in comparison with private enterprise, Mr. Lackie states that in many burghs the municipal authorities "undertook the supply of electrical energy at a time when no company would have ventured to do so." We could hardly regard it as a meritorious act on the part of the ratepayers' representatives to embark upon ventures so risky that private enterprise dare not tackle them! We do not know which are the authorities that Mr. Lackie has in mind, but apparently he has overlooked the numerous cases in which the municipality obtained a provisional order purely for the sake of preventing the supply of electricity to the public, either because it possessed a gas supply undertaking, or because it was jealous of private enterprise. In some cases, municipalities have inflicted injury not only upon private investors, but also upon the communities they represent, by repelling offers of supply at rates lower than they could possibly hope to attain themselves. In this respect the Tyneside district is a striking object lesson of the benefits of affording free play to private enterprise.

Municipalities are able, as he says, to borrow at a low rate of interest, but they also have to make annual payments for the redemption of the debt incurred, and this in great measure counteracts their advantage as compared with companies. Nevertheless it is true, as Mr. Lackie claims, that in many cases the municipal supply is given at very low rates.

Mr. Lackie points out that the advent of the metallic-lamp has benefited the industry not only prospectively, but also in the present, the temporary cessation of extensions of plant having enabled engineers to put their works into better order, and spurred them on to introduce new economies and improved methods of business-getting; this view is supported by the fact that both these subjects form prominent features of the agenda.

Last week we expressed the opinion that the commercial side of electricity supply was still, if anything, rather

neglected. The first two papers of the convention—those of Messrs. Cramb and Collings Bishop—were to some extent representative of the varying views held at the present time.

Mr. Cramb, whom we adjudge to be a "whole hogger," who would leave no stone unturned to achieve his object, outlines a complete and costly organisation for commercial development, such as very few engineers and committees have so far ventured even to consider. His paper emphasises the necessity of a carefully thought-out scheme as opposed to the feeble attempts which sometimes pass muster for business-getting.

On the other hand, the methods adopted at Newport may fairly be taken as representative of those of undertakings which achieve a considerable measure of success by the adoption of whatever means they consider specially suitable for local needs.

We have no wish to decry any attempts, however primitive they may be, to get business; indeed, we live in the hope that free discussion of papers such as those mentioned above will stimulate some of the laggards to bolder efforts on definite lines.

We are glad to note that both papers favour house-to-house canvassing, for it is only in this way that an intimate knowledge of a district, street or prospective consumer can be obtained, and this knowledge is an essential preliminary to efficient circularising.

Mr. Cramb refers to the necessity of watching building operations in the district, and we think he may go further with advantage and commence prospecting when the plans are authorised by the local surveyor—this, at any rate, is a necessity if he has to compete with a self-respecting gas company, which assuredly will not wait until the houses are built before pushing its wares.

The papers read by Messrs. Newington and Bremner, which constitute the engineering portion of the agenda, will serve a useful purpose in directing attention to methods of turning to the best advantage the characteristic properties of the steam turbine, so as to increase the capacity of existing plant at a moderate cost. These, and the further proceedings at the Convention, will be dealt with in our next issue.

Tramway and Railway Statistics.

WITH this issue our readers will receive our annual tables of data relating to British electric tramways, railways, and power companies. We regret to have again to draw attention to the almost complete cessation of progress in the development of electric traction in this country. Such additions as have been made are almost all in the nature of minor extensions to existing tramways, and these are mainly confined to municipal systems. The remarkable stagnation in private tramway enterprise may be attributed to various causes, of which the depression of trade, unfavourable returns due to last year's inclement weather, and the unfortunate results of unhealthy speculation in the past and lack of foresight in providing for depreciation and renewals, thus bringing securities into "bad odour" in the market, are not the least. The antagonism of municipalities towards tramway companies appears in great measure to have died out, and the necessity of intercommunication between adjoining systems for the public convenience has obtained general recognition, though there are notable instances where its benefits have not yet been experienced by the communities concerned.

Many schemes for railless trolley traction have been propounded by municipal authorities, but at the moment not one has been brought to fruition; while it is no doubt true that the system is adapted only to exceptional conditions, it is probable that these conditions obtain in many instances in this country, as on the Continent, where, we believe, some 20 systems are at work. However, as was pointed out at the Tramway Congress at Dublin, of which we commence a report in this issue, the efficiency and reliability of the motor-'bus have reached a stage which leaves little to be gained from the adoption of the railless system of traction.

The condemnation of the surface-contact system at Torquay, and the contemplated abandonment of the short length of conduit system at Bournemouth, are interesting recent developments; on the other hand, at Wolverhampton and Lincoln the surface contacts remain in satisfactory operation, and though the L.C.C. carries out all its extensions, where possible, with the overhead trolley, the London conduit system continues to work well.

The opening of the Victoria-London Bridge electrical section of the L.B. & S.C. Railway is the one noteworthy feature in connection with the Railway Table, and the company are to be congratulated, as well as the engineer, Mr. Philip Dawson, on the complete success of the conversion, which, we do not doubt, will lead to very important developments. Regarding the power companies there is nothing of importance to record.

In conclusion, we tender our hearty thanks to the managers, engineers and secretaries, to whose kind offices we are indebted for the correction of the data in the Tables.

The Sale of an Electrical Undertaking.

THE Acton Council has decided to negotiate with the Metropolitan Electric Supply Co. with a view to arranging the best terms upon which to hand over the Council's electricity undertaking to the company. By those who advocated the change it was pointed out that for the last five years the undertaking had been carried on at a loss; by the opponents it was contended that during the past year the concern had made a profit, and was now on the way to prosperity. The growth of consumers was regular, and the Council was building up a valuable business, the goodwill of which had been paid for by the money dropped upon it. How far the minority of the Council are content to respect the views of the majority is shown by the fact that at the conclusion of the meeting Councillor Shillaker said he would use every legitimate means within his power to prevent the Council from handing over the concern to the Metropolitan Electric Supply Co.

We do not know who the dissentient councillors at Acton are; nor do we understand the political views of anyone of them. But this much is certain, that no one of them would tolerate a loss for five years in his own business without being assured that something was wrong. With regard to the proposed transfer, it is noteworthy that it cannot now be carried out except with a provisional order. Sec. 14 of the Electric Lighting Act, 1909, provides that "a local authority . . . . shall not by transfer or otherwise divest themselves of any of the powers, rights, or obligations conferred or imposed upon them by the Electric Lighting Acts . . . . otherwise than under and in accordance with a provision contained in a licence, order, or special Act authorising such a divestiture."

Special Supplement to the "ELECTRICAL REVIEW," June 17th,

"ELECTRICAL REVIEW" LI

	Locality.	Lines Owned by	Year of opening.	Tramways Manager.	Tramways Electrical Engineer.	Miles of Route.	Gauge.	Weight of Rails per yard, lb.	Motor Cars.	Pow	
										Total Capacity in KW.	lo
1	ABERDEEN	Aberdeen Corporation	1899	R. Stuart Pilcher (Gen. Man.)	J. Alex. Bell	14.4	4ft. 8½in.	98	41 d.d., 28 s.d.	4,610*	65
2	ABERDEEN & DISTRICT	Aberdeen Suburban Tramways Co.	1904	A. Wilkie (Man. Dir.)		5.5	4ft. 8½in.	95	6 d.d., 3 s.d.	*	
3	ACCRINGTON	Accrington Corporation	1907	James Wilson	Harold Gray	7.05	4ft. 0in.	95	16 d.d., 7 s.d.	*	
4	AIRDRIE AND COATBRIDGE	Airdrie & Coatbridge Tramways Co.	1904	A. Delves		3.63	4ft. 7⅞in.	94	15 d.d.	*	
5	ASHTON, HYDE, DUKINF'D, STALYBRIDGE, MANCH'R.	Ashton-under-Lyne Corporation	1902	J. W. Dugdale (Eng. & Man.)	N. Appelbee	9	4ft. 8½in.	96	9 d.d., 6 s.d., 6 comb.	1,760*	
6	AYR	Ayr Corporation	1901	W. Grant	W. Grant	6	4ft. 8½in.	90	19 d.d.	1,325*	
7	BARKING	Barking Urban District Council	1903	Henley L. Howard	Henley L. Howard	3.25*	4ft. 8½in.	80, 100 and 106	7 d.d.	850†	
8	BARNSLEY	Barnsley & District Electric Traction Co., Ltd.	1902	P. H. Marco	P. H. Marco	3.06	4ft. 8½in	94	12 d.d., 1 s.d. regen.	*	
9	BARROW-IN-FURNESS	British Electric Traction Co., Ltd.	1904	W. F. Bladon		5.37	4ft. 0in.	94	9 d.d., 5 s.d., 2 demi-cars	*	
10	BARTON-UPON-IRWELL	Barton-upon-Irwell R.D.C. (South Lancashire Tram. Co., Lessees)	1907	J. R. Salter	J. R. Salter	1.5	4ft. 8½in.	90			
11	BATH	Bath Electric Tramways, Ltd.	1904	W. E. Hardy (G. Man. & Eng.)	W. E. Hardy	14.75	4ft. 8½in.	95	34 d.d., 6 comb.	675	
12	BATLEY	Yorkshire (Woollen District) Electric Tramways, Ltd.	1903	E. A. Paris (Man. Director)	R. C. Goldston	7	4ft. 8½in.	104		850*	
13	BELFAST	Belfast Corporation	1905	A. Nance (Man.) A. A. Blackburn (Eng.)	Thos. W. Bloxam (City Elec. Eng.)	38.50	4ft. 8½in.	105	242 d.d. (105 covd.)	4,200*	2,
14	BEXLEY	Bexley Urban District Council	1903	C. Mittelhausen	C. Mittelhausen	5.32	4ft. 8½in.	90	16 d.d.	480 (tr.)*	
15	BIDEFORD, WESTWARD HO! & APPLEDORE	Bideford, Westward Ho! and Appledore Railway Company	1901 & 1908	Henry Sowden	Henry Sowden	7	4ft. 8½in.	60 & 80	3 locomotives, 6 s.d.		
16	BIRKENHEAD	Birkenhead Corporation	1901	Wm. Wyld	Wm. Wyld	13.5	4ft. 8½in.	100	58 d.d., 1 s.d.	1,475	1,
17	BIRMINGHAM	City of Birmingham Tramways Co.	1901	R. W. Cramp (Gen. Man.)	R. W. Cramp	18.13*	3ft. 6in.	90 & 97	152 d.d. (48 cable)	1,098†	
18	BIRMINGHAM	Birmingham Corporation	1904	Alfred Baker		34	3ft. 6in.	104	300 d.d.	*	
19	BIRMINGHAM	Birmingham & Midland Tramways Ltd.	1905	R. W. Cramp (Gen. Man.)		12.1	3ft. 6in.		49 d.d., 8 s.d.	3,530	
20	BLACKBURN	Blackburn Corporation	1899	James H. Cowell (Gen. Man.)		14.67	4ft. 0in.	92½	48 d.d., 12 s.d. 1 open car.	4,518*	
21	BLACKPOOL	Blackpool Corporation	1885	C. Furness (Man.) F. Field (Eng.)	Charles Furness (G. Man. & Trys. Eng.)	11.87	4ft. 8½in.	95	61 d.d.	1,800*	
22	BLACKPOOL & FLEETWOOD	Blackpool & Fleetwood Tramroad Company	1898	J. Cameron	Angus Cameron	8	4ft. 8½in.	98, 83 and 70	34 s.d.	600	
23	BLACKPOOL, ST. ANNES & LYTHAM	Blackpool, St. Annes & Lytham Tramways Co., Ltd.	1903	Harry W. Laing	Harry W. Laing	7.5	4ft. 8½in.	90	40 d.d.	760*	
24	BOLTON	Bolton Corporation	1900	Arthur A. Day	Arthur A. Day	26.38	4ft. 8½in.	96	103 d.d., 3 s.d.	7,600*	1,
25	BOOTLE	Bootle Corporation	1900	T. Dawson Clothier	T. Dawson Clothier	3.87	4ft. 8½in.	90	*	2,050†	
26	BOURNEMOUTH, POOLE & CHRISTCHURCH	Bournemouth Corporation	1902	C. W. Hill (Gen. Man.)	I. Bulfin	21.5	3ft. 6in.	90, 100, 105	80 d.d., 1 saloon	1,200	(tr. 1,
27	BRADFORD	Bradford Corporation	1898	C. J. Spencer (G. Man. & Eng.)	C. J. Spencer	54.81	4ft. 0in.	103	238 d.d.	*	
28	BRIGHTON	Brighton Corporation	1901	W. Marsh	W. Marsh	9.49	3ft. 6in.	101	50 d.d.	7,200	1,
29	BRIGHTON BEACH	Volk's Electric Railway (Magnus Volk, Ltd.)	1883*	M. H. Volk	M. H. Volk	1.5	2ft. 8½in.	35	8 s.d.	60†	
30	BRISTOL	Bristol Tramways & Carriage Co., Ltd.	1895 (elec.)	Chas. Challenger		30.5	4ft. 8½in.	92½	234 d.d.	2,150	
31	BURNLEY	Burnley Corporation	1902	H. Mozley	James E. Starkie	10.76	4ft. 0in.	102 & 105	43 d.d., 9 s.d. (8 covered)	1,990*	1
32	BURTON-ON-TRENT	Burton-on-Trent Corporation	1903	P. J. Pringle	P. J. Pringle	6.66*	3ft. 6in.	90	20 d.d.	1,710†	
33	BURTON SWADLINCOTE, ASHBY AND CRESLEY	Midland Railway Co.	1906	James Toulmin	James Toulmin	12.02	3ft. 6in.	90	20 d.d.	330	(tr.
34	BURY (LANCS.)	Bury Corporation	1903	William Clough	S.J. Watson (Boro' El. Eng.)	12½	4ft. 8½in.	102¾	50 d.d.	1,500*	
35	CAMBORNE, REDRUTH AND ILLOGAN	Urban Electric Supply Co., Ltd., Camborne & Redruth Tramways	1902	L. A. Hards	L. A. Hards	4.5	3ft. 6in.	90	6 d.d., 2 s.d.*	1,025†	
36	CAMBUSLANG, HAMILTON, MOTHERWELL & WISHAW	Lanarkshire Tramways Co.	1903	G. F. Moller	G. F. Moller	17	4ft. 7⅞in.	96 & 101	60 d.d.	825	
37	CARDIFF	Cardiff Corporation	1902	Arthur Ellis	Arthur Ellis	17.61	4ft. 8½in.	100	100 d.d., 14 s.d., 16 comb.	7,000*	3,
38	CARLISLE	City of Carlisle Electric Tramways Co., Ltd.	1900	J. McNee	J. B. Wilson	7	3ft. 6in.	87	12 d.d., 3 s.d.	*	
39	CAVEHILL AND WHITEWELL	Cavehill & Whitewell Tramway Co.	1906	F. P. Comber		3.29	4ft. 9in.	105	8 d.d.	*	
40	CHATHAM, GILLINGHAM, RAINHAM, ROCHESTER*	Chatham District Light Railways Co.	1902	W. Jensen	J. C. Whiteley	14.98	3ft. 6in.	95 to 105	45 d.d.	675†	
41	CHELTENHAM & DISTRICT	Cheltenham and District Light Railway Co.	1901	H. J. McCormick		10.25	3ft. 6in	83 & 90	18 d.d., 2 s.d.	*	
42	CHESTER	Chester Corporation	1903	J. Gardner	S. E. Britton	3.62	3ft. 6in.	92 & 100	17 d.d., 1 s.d. (inc. regen.)	1,325*	1,
43	CHESTERFIELD	Chesterfield Corporation	1904	R. L. Acland	R. L. Acland	3.62	4ft. 8½in.	93	14 d.d.	1,000*	
44	CLONTARF	Clontarf & Hill of Howth Tramroad Co.	1900	C. W. Gordon	P. S. Sheardown	5.5	5ft. 3in.	60, 83, 95	12 d.d.	*	
45	COLCHESTER	Colchester Corporation	1904	R. C. Bullough		6	3ft. 6in.	95	18 d.d.	*	
46	COLNE AND TRAWDEN	Colne and Trawden Light Railways Co.	1903	Marten Turner	Marten Turner	5.19	4ft. 0in.	103	12 d.d.	*	
47	CORK	Cork Electric Tramways & Lighting Co., Ltd.	1898	H. G. Whiting	H. H. Nalder	9.89	2ft. 11½in.	83	35 d.d.	2,680*	400

' LIST OF ELECTRIC TRAMWAY

OF THE UNITED KING

	Motor Cars.	Power Station. Total Capacity in KW.	Power Station. Max. load in KW.	Power Station. Battery max. discharge.	Capital Outlay on Tramway and Rolling Stock.	Capital Outlay on Power Station.	Annual Electric Car Mileage.	Passengers Carried per Annum.	Remarks.	
	41 d.d., 28 s.d.	4,610*	655 ave.	..	£333,856	*	1,553,978	17,446,725	*Lighting and traction station. Energy purchased from Corporation Electricity Dept. Data to May 31, 1909.	1
	6 d.d., 3 s.d.	*	..	..	£41,750	*	225,788†	2,166,064†	*Energy purchased from Aberdeen Corp. †Including traffic over Aberdeen Corp's. lines. Data to Jan. 31, 1910	2
	16 d.d., 7 s.d.	*	..	..	£126,575	*	482,259	3,801,879	*Lighting and traction station. Data to Mar. 31, 1909	3
	15 d.d. ..	*	..	..	£67,200	*	277,817	2,843,982	* Energy purchased from Coatbridge and Airdrie Electric Supply Co., Ltd. Data to Dec. 31, 1908	4
	9 d.d., 6 s.d., 6 comb.	1,760*	820	..	£104,000	£73,339	46,000	5,400,000	*Lighting and traction station. Data for 1908-9 ..	5
	19 d.d. ..	1,325*	750	100 KW.	£82,170	£96,000*	390,105	3,610,537	*Lighting and traction station. Energy purchased from Corporation. Data to May 15, 1909	6
	7 d.d. ..	850†	584	..	£56,000*	£23,000†	105,000	1,280,420	* ¾ m. leased to East Ham. † Lighting and traction station	7
	12 d.d., 1 s.d. regen.	*	..	..	£67,625	*	206,884	1,820,245	*Energy purchased from Barnsley Corporation. Data to Dec. 31, 1908	8
	9 d.d., 5 s.d., 2 demi-cars	*	..	..	..	*	329,495	3,052,571	*Energy purchased from Corporation of Barrow-in-Furness. Data to Dec. 31, 1908	9
	.. .. ..	..	..	..	£13,000	..	*	*	*Receipts, passengers, &c., included in South Lancashire Tramway returns	10
	34 d.d., 6 comb.	675	..	..	£347,711		956,128	6,241,875	Twelve motor omnibuses in use. Data to Dec. 30, 1908	11
	.. .. ..	850*	350	90 KW.	..	£42,871*	†	†	*Lg. & tr. stn. of the Batley Corp. †Run in conj. with adjoining lines of the Co. Data to Dec. 31, 1907	12
	242 d.d. (105 covd.)	4,200*	2,860	..	£454,242	£87,159*	5,068,548	46,347,591	*Lg. & tr. stn.; 1,200 KW. available for both purposes. Data to Mar. 31, 1910	13
	16 d.d. ..	480 (tr.)*	194	37 KW.	£74,136	£27,417†	258,245§	1,717,182	*Tramway station supplying energy for lighting. †Lg. £5,137, tr. £22,280. §Bexley cars only. Data to Mar./09	14
		..	..	..	..	..	..	..	.. ..	15
	3 locomotives, 6 s.d. ..	..	..	..	..	..	..	..		
	58 d.d., 1 s.d.	1,475	1,250	201.6 KW.	£309,510	£53,918	1,201,476	12,202,056	Data to Mar. 31, 1910	16
	152 d.d. (48 cable)	1,098†	..	..	£534,029 (inc. cable)	..	2,220,961	25,301,755	*6½ miles leased from Aston Corporation. †Two stations. Data to Dec. 31, 1907	17
	300 d.d. ..	*	..	..	£936,000	*	6,011,738	75,601,195	*Energy purchased from Birmingham Corporation Electricity Department. Data to Mar. 31, 1909	18
	49 d.d., 8 s.d.	3,530	..	..	£453,656	..	1,002,124	11,006,985	Data to Dec. 31, 1908	19
	48 d.d., 12 s.d. 1 open car.	4,518*	..	..	£334,006	*	1,136,464	10,439,450	*Lighting and traction station. Energy purchased from Elec. Dept. at 1.4d. per unit. Data to Mar. 25, 1910	20
	61 d.d. ..	1,800*	880	1,680 A.H.	£282,631	£200,000*	945,229	8,138,569	*Lighting and traction station. Data to Mar. 31, 1909..	21
	34 s.d. ..	600	480	380 KW.	£198,479		614,693	2,803,680	Data to Dec. 31, 1909	22
	40 d.d. ..	760*	476	..	..	..	682,000	3,313,500	*Lighting and traction station. Data to Oct 31, 1909 ..	23
	103 d.d., 3 s.d.	7,600*	1,800	..	£504,694	£325,987*	2,641,292	27,018,149	*Lighting and traction station. Energy purchased from Electricity Dept. Data to Mar. 31, 1910	24
	*	2,050†	350 (tr. only)	150 KW.	£76,616	£17,227†	*	*	*Running leased to Liverpool Corporation. †Lighting and traction station. Data to Mar. 31, 1910	25
	80 d.d.,1 saloon	1,200	1,000	..	£390,224		18,000,000	14,090,000	1.35 miles double-track conduit. Power for Poole and Christchurch supplied by Co. Data to Mar. 31, 1910	26
	238 d.d. ..	*	..	..	£920,001	*	5,436,529	50,518,816	*Lg. & tr. stn, energy purchd. from Elec. Dept. at 1½d.p.u., and Shipley U.D.C. at 1⅜d. p.u. Data to Mar. 31, 1910	27
	50 d.d. ..	7,200	1,270	550 KW.	£274,905	*	1,130,685	10,759,947	*Lighting and traction station; energy purchased from Electricity Department. Data to April 12, 1910	28
	8 s.d. ..	60†	40†	36 KW.	£10,000		80,000	700,000	*Pioneer of electric traction in Great Britain. †Power from Brighton Corp. also. Data to Apr. 14, 1910	29
	234 d.d. ..	2,150	..	..	£1,491,453	..	5,727,943 (1907)	46,652,389	Data for 1908	30
	43 d.d., 9 s.d. (8 covered)	1,990*	1,040	190 KW.	£237,625 inclusive	*	1,263,118	12,911,113	*Lighting and traction station; energy purchased from Burnley and Nelson Corps. Data to Mar. 31, 1910	31
	20 d.d. ..	1,710†	375 (tr. only)	..	£106,000	£83,395	428,219	3,082,804	*1 mile leased to Midland Railway Co. † Lighting and traction station. Data to Mar. 31, 1910	32
	20 d.d. ..	330	..	440 A.	..	..	..	..	Data to April 15, 1910	33
	50 d.d. ..	1,500*	825	..	£281,145	*	1,566,768	12,333,902	*Lighting and traction station. Data for Mar. 31, 1910	34
	6 d.d., 2 s.d.*	1,025†	540	150 KW.	£50,107	£59,780	150,898	1,311,613	*2 electric locos. & 16 wagons, 247 tons of tin ore daily. †Lg. & tr. stn.; 100 KW. for tr. Data to Dec. 31, 1909	35
	60 d.d. ..	825	945	..	£314,621†	£57,575	1,744,198	13,169,448	*Also Bothwell, Uddingston, New Mains and Larkhall. †Ex. preliminary expenses, &c. Data to Dec. 31, 1909	36
	100 d.d.,14 s.d., 16 comb.	7,000*	3,550	150 KW.	£767,108 inclusive	..	2,514,647½	25,447,994	Energy sold to Lighting Department at 0.75d. per unit. *Includes lighting load & plant. Data to Mar. 31, 1910	37
	12 d.d., 3 s.d.	*	..	..	£101,183	*	353,012	2,600,210	*Energy purchased from Carlisle Corporation. Data to Dec. 31, 1908	38
	8 d.d. ..	*	..	..	£67,211	*	125,354	497,766	*Energy purchased from Belfast Corporation. Data to Dec. 31, 1908	39
	45 d.d. ..	675†	702	..	£188,167	£63,000 inc. car shed	1,144,395	8,750,532	*Also Strood, Frindsbury, Delce & Borstal, leased. †Part Energy purch. from Kent El. P. Co. Data to Dec. 31, '09	40
	18 d.d., 2 s.d.	*	..	..	£120,000	*	514,278	2,758,822	*Energy purchased from Cheltenham Corporation lighting & traction station. Data to Aug. 16, 1909	41
	17 d.d., 1 s.d. (inc. regen.)	1,325*	1,320	154 KW.	£82,848	£118,900	366,102	2,989,707	*Lighting and traction station. Data to March 25, 1910	42
	14 d.d. ..	1,000*	800	..	£69,792	£7,000†	282,228	2,450,000	*Lighting and traction station. †Extra outlay for traction	43
	12 d.d. ..	*	..	..	£72,500	*	152,000	524,000	*Energy supplied by Dublin United Tramways Co. ..	44
	18 d.d. ..	*	..	..	£69,555	*	321,610	1,725,948	*Lighting and traction station. Energy purchased from Corporation at 1½d. per unit. Data to Mar. 31, 1910	45
	12 d.d. ..	*	..	..	..	*	297,962	1,949,859	*Energy purchased from Colne Corporation. Data to Dec. 31, 1909	46
	35 d.d. ..	2,680*	400 (tr.		£173,466	*				

	Locality.
96	KILMARNOCK .. ..
97	KIRKCALDY .. .. ..
98	LANCASTER .. .. ..
99	LEAMINGTON & WARWICK
100	LEEDS .. ..
101	LEICESTER .. .. ..
102	LEITH .. ..
103	LEYTON .. .. ..
104	LLANDUDNO, RHOS-ON-SEA & COLWYN BAY
105	LINCOLN AND BRACEBRIDGE
106	LIVERPOOL .. .. ..
107	LIVERPOOL—PRESCOT ..
108	LONDON (COUNTY).. ..
109	LOWESTOFT .. .. ..
110	LUTON .. .. ..
111	MAIDSTONE .. .. ..
112	MANCHESTER .. ..
113	MANSFIELD & DISTRICT ..
114	MERTHYR TYDFIL .. ..
115	MEXBOROUGH, RAWMARSH & SWINTON
116	MIDDLESBROUGH, STOCKTON & THORNABY
117	MIDDLESEX & HERTFORDSHIRE
118	MIDDLETON, ROCHDALE AND OLDHAM
119	MUSSELBURGH & DISTRICT
120	NELSON .. .. ..
121	NEWCASTLE-ON-TYNE ..
122	NEWPORT (MON.) .. ..
123	NORTHAMPTON .. ..
124	NORWICH .. .. ..
125	NOTTINGHAM .. ..
126	OLDHAM .. .. ..
127	OLDHAM, ASHTON & HYDE
128	PAISLEY, JOHNSTON, RENFREW, BARRHEAD
129	PENGE, SUTTON, WALL'N., MITCHAM, TTG., W.CR'N.
130	PERTH .. .. ..
131	PETERBOROUGH .. ..
132	PLYMOUTH .. .. ..
133	PLYMOUTH, STONEHOUSE AND DEVONPORT
134	PONTYPRIDD .. ..
135	PORTSMOUTH .. ..
136	POTTERIES .. .. ..
137	PRESTON .. .. ..
138	PURBROOK, COSHAM, W'VILLE AND HORNDEAN
139	RADCLIFFE .. .. ..
140	RAWTENSTALL .. ..

20	BLACKBURN	Blackburn Corporation	1899	James H. Cowell (Gen. Man.)		14.67	4ft. 0in.	92½	48 d.d., 12 s.d. 1 open car.	4,518*	
21	BLACKPOOL	Blackpool Corporation	1885	C. Furness (Man.) F. Field (Eng.)	Charles Furness (G. Man. & Trys. Eng.)	11.87	4ft. 8½in.	95	61 d.d.	1,800*	
22	BLACKPOOL & FLEETWOOD	Blackpool & Fleetwood Tramroad Company	1898	J. Cameron	Angus Cameron	8	4ft. 8½in.	98, 83 and 70	34 s.d.	600	
23	BLACKPOOL, ST. ANNES & LYTHAM	Blackpool, St. Annes & Lytham Tramways Co., Ltd.	1903	Harry W. Laing	Harry W. Laing	7.5	4ft. 8½in.	90	40 d.d.	760*	
24	BOLTON	Bolton Corporation	1900	Arthur A. Day	Arthur A. Day	26.38	4ft. 8½in.	96	108 d.d., 3 s.d.	7,600*	1,
25	BOOTLE	Bootle Corporation	1900	T. Dawson Clothier	T. Dawson Clothier	8.87	4ft. 8½in.	90	*	2,050†	
26	BOURNEMOUTH, POOLE & CHRISTCHURCH	Bournemouth Corporation	1902	C. W. Hill (Gen. Man.)	I. Bulfin	21.5	3ft. 6in.	90, 100, 105	80 d.d., 1 saloon	1,200	(tr. 1,
27	BRADFORD	Bradford Corporation	1898	C. J. Spencer (G. Man. & Eng.)	C. J. Spencer	54.81	4ft. 0in.	102	238 d.d.	*	
28	BRIGHTON	Brighton Corporation	1901	W. Marsh	W. Marsh	9.49	3ft. 6in.	101	50 d.d.	7,200	1,
29	BRIGHTON BEACH	Volk's Electric Railway (Magnus Volk, Ltd.)	1883*	M. H. Volk	M. H. Volk	1.5	2ft. 8½in.	35	8 s.d.	60†	
30	BRISTOL	Bristol Tramways & Carriage Co., Ltd.	1895 (elec.)	Chas. Challenger		30.5	4ft. 8½in.	92½	234 d.d.	2,150	
31	BURNLEY	Burnley Corporation	1902	H. Mozley	James E. Starkie	10.76	4ft. 0in.	102 & 105	43 d.d., 9 s.d. (8 covered)	1,990*	
32	BURTON-ON-TRENT	Burton-on-Trent Corporation	1903	P. J. Pringle	P. J. Pringle	6.66*	3ft. 6in.	90	20 d.d.	1,710†	
33	BURTON, SWADLINCOTE, ASHBY AND CRESLEY	Midland Railway Co.	1906	James Toulmin	James Toulmin	12.02	3ft. 6in.	90	20 d.d.	330	(tr.
34	BURY (LANCS.)	Bury Corporation	1903	William Clough	S.J. Watson (Boro' El. Eng.)	12½	4ft. 8½in.	102¾	50 d.d.	1,500*	
35	CAMBORNE, REDRUTH AND ILLOGAN	Urban Electric Supply Co., Ltd., Camborne & Redruth Tramways	1902	L. A. Hards	L. A. Hards	4.5	3ft. 6in.	90	6 d.d., 2 s.d.*	1,025†	
36	CAMBUSLANG, HAMILTON, MOTHERWELL & WISHAW	Lanarkshire Tramways Co.	1903	G. F. Moller	G. F. Moller	17	4ft. 7¾in.	96 & 101	60 d.d.	825	
37	CARDIFF	Cardiff Corporation	1902	Arthur Ellis	Arthur Ellis	17.61	4ft. 8½in.	100	100 d.d., 14 s.d., 16 comb.	7,000*	3,
38	CARLISLE	City of Carlisle Electric Tramways Co., Ltd.	1900	J. McNee	J. B. Wilson	7	3ft. 6in.	87	12 d.d., 3 s.d.	*	
39	CAVEHILL AND WHITEWELL	Cavehill & Whitewell Tramway Co.	1906	F. P. Comber		3.29	4ft. 9in.	105	8 d.d.	*	
40	CHATHAM, GILLINGHAM, RAINHAM, ROCHESTER	Chatham District Light Railways Co.	1902	W. Jensen	J. C. Whiteley	14.98	3ft. 6in.	95 to 105	45 d.d.	675†	
41	CHELTENHAM & DISTRICT	Cheltenham and District Light Railway Co.	1901	H. J. McCormick		10.25	3ft. 6in	83 & 90	18 d.d., 2 s.d.	*	
42	CHESTER	Chester Corporation	1903	J. Gardner	S. E. Britton	3.62	3ft. 6in.	92 & 100	17 d.d., 1 s.d. (inc. regen.)	1,325*	1,
43	CHESTERFIELD	Chesterfield Corporation	1904	R. L. Acland	R. L. Acland	3.62	4ft. 8½in.	98	14 d.d.	1,000*	
44	CLONTARF	Clontarf & Hill of Howth Tramroad Co.	1900	C. W. Gordon	P. S. Sheardown	5.5	5ft. 3in.	60, 83, 95	12 d.d.	*	
45	COLCHESTER	Colchester Corporation	1904	R. C. Bullough		6	3ft. 6in.	95	18 d.d.	*	
46	COLNE AND TRAWDEN	Colne and Trawden Light Railways Co.	1903	Marten Turner	Marten Turner	5.19	4ft. 0in.	103	12 d.d.	*	
47	CORK	Cork Electric Tramways & Lighting Co., Ltd.	1898	H. G. Whiting	H. H. Nalder	9.89	2ft. 11½in.	83	35 d.d.	2,680*	400 o
48	COVENTRY	Coventry Electric Tramways Co.	1895, '98, & 1905	T. R. Whitehead	I. E. Winslow (Cons. Eng.)	13.25	3ft. 6in.	81 & 65	36 d.d.	700	
49	CROYDON	Croydon Corporation	1901	T. B. Goodyer	H. B. Harris	13	4ft. 8½in.	95 & 102	70 d.d.	1,750* (tr. only)	
50	DARLINGTON	Darlington Corporation	1904	J. R. P. Lunn	J. R. P. Lunn	4.87	3ft. 6in.	90	16 s.d.	*	8
51	DARTFORD, STONE AND CRAYFORD	Balfour, Beatty & Co., Lessees	1906	A. G. Balfour (Acting)	A. G. Balfour	6.5	4ft. 8½in.	100	12 d.d.	*	
52	DARWEN	Darwen Corporation	1900	R. W. Smith-Saville (Gen. Man. & Eng.)	R. W. S.-Saville C. Garnett	4.25	4ft. 0in.	95½	14 d.d., 3 s.d. regen.	900*	
53	DERBY	Derby Corporation	1904	F. Harding	T. P. Wilmshurst	13	4ft. 0in.	95	45 d.d., 4 s.d.	1,100*	
54	DEVONPORT AND DISTRICT	Devonport & District Tramways Co.	1901	C. W. Durnford	C. W. Durnford	8.85	3ft. 6in.	92	25 d.d.	*	
55	DONCASTER	Doncaster Corporation	1902	E. S. Rayner	E. S. Rayner	8.3	4ft. 8½in.	100	25 d.d.	1,040*	
56	DOVER AND RIVER	Dover Corporation	1897	Edward Carden (G. M. & Elec. Eng.)	W. C. Hawke (Boro' Eng., P. W.)	4.75	3ft. 6in.	90 & 87	21 d.d.	209* (tr. only)	
57	DUBLIN	Dublin United Tramways Co. (1896) Ltd.	1896	C. W. Gordon	P. S. Sheardown	54	5ft. 3in.	105	330 d.d., 3 s.d.	4,300*	2,
58	DUBLIN AND LUCAN	Dublin & Lucan Electric Railway Co.	1900	H. Harrison	H. Harrison	6.75	3ft. 6in.	50	6 d.d., 1 loco., 18 wagons	240	
59	DUDLEY, STOURBRIDGE AND DISTRICT	Dudley, Stourbridge and District Electric Traction Co., Ltd.	1899	R. W. Cramp (Gen. Man.)		22.42	3ft. 6in.	90	24 d.d., 35 s.d.	500	
60	DUMBARTON AND DISTRICT	Dumbarton Burgh and County Tramways Co., Ltd.	1907	Joseph McMahon	Joseph McMahon	13	4ft. 7¾in.	90	6 d.d., 24 comb.	*	7
61	DUNDEE	Dundee Corporation	1900 (elec.)	Peter Fisher	H. Richardson	14½	4ft. 8½in.	94 to 100	60 d.d., 6 comb.	*	
62	DUNDEE AND DISTRICT	Dundee, Broughty Ferry & District Tramways Co., Ltd.	1905	Daniel Fisher	Daniel Fisher	5.22	4ft. 8½in.	90	14 d.d.	420	5
63	EAST HAM	East Ham Corporation	1901	W. C. Ullmann	W. C. Ullmann	7.6	4ft. 8½in.	90	40 d.d.	1,925*	1,4
64	ECCLES	Eccles Corporation, leased to and worked by Salford Corporation	1902	G. W. Holford (Tr. Man., Salford).	H. W. Angus (El. Eng., Eccles).	5.12	4ft. 8½in.	102	11 d.d.	240*	3
65	ERITH	Erith Urban District Council	1905	Arthur Coveney	Arthur Coveney	4.75	4ft. 8½in	100	14 d.d., 2 s.d. regen.	*	
66	EXETER	Exeter Corporation	1905	H. C. Bartlett	H. D. Munro	4.25	3ft. 6in.	95	20 d.d.	*	
67	FALKIRK AND DISTRICT	Falkirk and District Tramways Co.	1905	D. Hays	D. Hays	6.21	4ft. 0in.	90	18 d.d.	*	
68	FARNWORTH	Farnworth Urban District Council (leased to S. Lanc. Tramways Co.)	1901	J. R. Salter	A. J. Hutchinson	4.33	4ft. 8½in.	98	13 d.d.	550*	30
69	FELIXSTOWE PIER	Coast Development Corporation	1905	H. Wood	E. A. Lambert	0.5	3ft. 6in.	36	2 motor, 1 trailer	*	
70	GATESHEAD, FELLING AND WHICKHAM	Gateshead & District Tramways Co.	1901	W. Morrison		11.28	4ft. 8½in.	90	25 d.d., 15 s.d. 11 comb.	*	
71	GIANT'S CAUSEWAY & PORTRUSH	Giant's Causeway and Portrush Electric Tramway Co.	1883	D. Fall	W. A. Traill	8	3ft. 0in.	48	5 s.d., 18 tr.	100	9
72	GLASCOW	Glasgow Corporation	1898	James Dalrymple	J. Ferguson (Chf.) E. S. Goslin (El.)	94.8	4ft. 7¾in.	110	763 d.d.	14,200	8,36
73	GLOSSOP	Urban Electric Supply Co., Ltd.	1903	C. E. Knowles	C. E. Knowles	4.5	4ft. 8½in.	90	7 d.d., 1 s.d.	425*	15 (tr. on 40
74	GLOUCESTER	Gloucester Corporation	1904	Leonard Johnston	Leonard Johnston	9	3ft. 6in.	90	30 d.d.	1,150*	
75	GOSPORT & FAREHAM	Provincial Tramways Co., Ltd.	1906	J. Fereday Glenn	J. Fereday Glenn J. Glenn (Cons.)	7.48	4ft. 7¾in.	95	22 d d.	750*	
76	GRAVESEND, NORTHFLEET AND SWANSCOMBE	Gravesend and Northfleet Electric Tramways, Ltd.	1902	P. N. Gray	J. Creagh	6.5	4ft. 8½in.	87	16 d.d., 2 s.d.	*	
77	GREENOCK AND PORT GLASCOW	Greenock & Port Glasgow Tramways Co.	1901	G. W. King		7.42	4ft. 7¾in.	92	40 (1 démi-car)	*	
78	GRIMSBY & CLEETHORPES	Gt. Grimsby Street Tramways Co.	1902	H. L. White	H. Orme White	6	4ft. 8½in.	90	32 d.d.	300	
79	GUERNSEY ST. PETER PORT & ST. SAMPSON'S	Guernsey Railway Co., Ltd.	1892	A. G. Bird	A. G. Bird	8.5	4ft. 8½in.	40, 74 & 84	9 d.d., 1 s.d. 8 trailers	130	100
80	HALIFAX	Halifax Corporation	1898	W. M. Rogerson	W. M. Rogerson	37.4	3ft. 6in.	95½	93 d.d., 2 s.d.	4,750*	2,370
81	HARTLEPOOL, EAST & WEST & SEATON CAREW	Hartlepool Electric Tramways Co., Ltd.	1896	George Cardwell	George Cardwell	6.72	3ft. 6in.	90	21 d.d.	400	360
82	HASLINGDEN	Haslingden Corporation	1908	Barnes Kay	Barnes Kay	3	4ft. 0in.	100	*	†	
83	HASTINGS, ST. LEONARDS AND BEXHILL	Hastings Tramways Co.	1905	Thos. B. Holliday	Thos. B. Holliday	19.3*	3ft. 6in.	90	65 d.d.	2,100	
84	HERNE BAY PIER	Herne Bay U. D. C.	1898	Henry C. Dufton	Henry C. Dufton	0.75	3ft. 0in.	60	8 s.d.	50	
85	HEYWOOD	Heywood Corp. owner; Bury and Rochdale Corporations, lessees	1905	Jas. Stott	Jas. Stott	4.25	4ft. 8½in.	90	*	900†	400
86	HUDDERSFIELD	Huddersfield Corporation	1901	R. H. Wilkinson	R. H. Wilkinson	28½	4ft. 7¾in.	98 & 105	75 d.d.	2,200	1,790
87	HULL	Hull Corporation	1899	W. J. McCombe	J. Wilkinson	16	4ft. 8½in.	94	116 d.d	1,560	1,350
88	ILFORD	Ilford Urban District Council	1903	A. Woolstencroft (Traffic Sup.)	A. H. Shaw	6.63	4ft. 8½in.	100	26 d.d. (6 bogie cars)	*	
89	ILKESTON	Ilkeston Corporation	1903	H. P. Stokes	H. P. Stokes	3.8	3ft. 6in.	90	13 d.d.	1,000*	600
90	IPSWICH	Ipswich Corporation	1903	F. Ayton	F. Ayton	10.8	3ft. 6in.	90	36 d.d.	*	
91	ISLE OF MAN: (1) DOUGLAS-RAMSEY (2) SNAEFELL MOUNTAIN	Manx Electric Railway Co., Ltd.	1893, '94 1898 1905	F. Edmondson (Gen. Man.)	F. Edmondson	18	3ft. 0in.	56 & 63½	39 mr., 48 tr. (s.d. comb.)	1,200	1,837
	(3) DOUGLAS SOUTHERN	Douglas Southern Electric Tramways Ltd.	1896	R. Orton	R. Orton	4.5	3ft. 6in.	36	2 automob.		
						3.5	4ft. 8½in.	65	8 d.d.	200	
92	ISLE OF THANET	Isle of Thanet Electric Tramways & Lighting Co., Ltd.	1901	J. A. Forde	J. A. Forde	11.5	3ft. 6in.	90	59 d.d.	1,000*	1,000 (inc. lg
93	JARROW AND DISTRICT	Jarrow & District Electric Traction Co., Ltd.	1906	W. Morrison (Man. Dir.)	G. McClelland (Supt.)	2.54	4ft. 8½in.	95	10 d.d.	*	
94	KEIGHLEY	Keighley Corporation	1904	J. W. Bamber	J. M. Smyth (Power Station)	3.27	4ft. 0in.	95	12 d.d., 2 motor buses	200*	160
95	KIDDERMINSTER AND STOURPORT	Kidderminster & Stourport Electric Tramway Co., Ltd.	1898	A. Charlton (Eng. & Man.)	A. Charlton	4.6	3ft. 6in.	75	4 d.d., 9 s.d.	*	

48 d.d., 12 s.d. 1 open car.	4,518*	..	..	£334,006	*	1,136,464	10,439,450	*Lighting and traction station. Energy purchased from Elec. Dept. at 1.4d. per unit. Data to Mar. 25, 1910	20
61 d.d. ..	1,800*	880	1,680 A.H.	£282,631	£200,000*	945,299	8,138,569	*Lighting and traction station. Data to Mar. 31, 1909..	21
34 s.d. ..	600	480	380 KW.	£198,479		614,693	2,803,680	Data to Dec. 31, 1909	22
40 d.d. ..	760*	476	..	..	..	682,000	3,313,500	*Lighting and traction station. Data to Oct 31, 1909 ..	23
103 d.d., 3 s.d.	7,600*	1,800	..	£504,694	£325,987*	2,641,292	27,018,149	*Lighting and traction station. Energy purchased from Electricity Dept. Data to Mar. 31, 1910	24
*	2,050†	350 (tr. only)	150 KW.	£77,616	£17,227†	*	*	*Running leased to Liverpool Corporation. †Lighting and traction station. Data to Mar. 31, 1910	25
80 d.d.,1 saloon	1,200	1,000	..	£390,224		18,000,000	14,090,000	1.35 miles double-track conduit. Power for Poole and Christchurch supplied by Co. Data to Mar. 31, 1910	26
238 d.d. ..	*	..	..	£920,001	*	5,436,529	50,518,816	*Lg. & tr. stn, energy purchd. from Elec. Dept. at 1½d.p.u., and Shipley U.D.C. at 1¾d. p.u. Data to Mar. 31, 1910	27
50 d.d. ..	7,200	1,270	550 KW.	£274,905	*	1,130,685	10,759,947	*Lighting and traction station; energy purchased from Electricity Department. Data to April 12, 1910	28
8 s.d. ..	60†	40†	36 KW.	£10,000		80,000	700,000	*Pioneer of electric traction in Great Britain. †Power from Brighton Corp. also. Data to Apr. 14, 1910	29
234 d.d. ..	2,150	..	..	£1,491,453	..	5,727,943 (1907)	46,652,389	Data for 1908	30
43 d.d., 9 s.d. (8 covered)	1,990*	1,040	190 KW.	£237,625 inclusive	*	1,263,118	12,911,113	*Lighting and traction station; energy purchased from Burnley and Nelson Corps. Data to Mar. 31, 1910	31
20 d.d. ..	1,710†	875 (tr. only)	..	£106,000	£83,395	428,219	3,082,804	*1 mile leased to Midland Railway Co. † Lighting and traction station. Data to Mar. 31, 1910	32
20 d.d. ..	330	..	440 A.	..	..	..	12,333,902	Data to April 15, 1910	33
50 d.d. ..	1,500*	825	..	£281,145	*	1,566,768	1,311,913	*Lighting and traction station. Data for Mar. 31, 1910	34
6 d.d., 2 s.d.*	1,025†	540	150 KW.	£50,107	£59,780	150,898		*2 electric locos. & 16 wagons, 247 tons of tin ore daily. †Lg. & tr. stn.; 100 KW. for tr. Data to Dec. 31, 1909	35
60 d.d. ..	825	945	..	£314,621†	£57,575	1,744,198	13,169,448	*Also Bothwell, Uddingston, New Mains and Larkhall. †Ex. preliminary expenses, &c. Data to Dec. 31, 1909	36
100 d.d.,14 s.d., 16 comb.	7,000*	3,550	150 KW.	£767,108 inclusive	..	2,514,647½	25,447,994	Energy sold to Lighting Department at 0.75d. per unit. *Includes lighting load & plant. Data to Mar. 31, 1910	37
12 d.d., 3 s.d.	*	..	..	£101,188	*	353,012	2,600,210	*Energy purchased from Carlisle Corporation. Data to Dec. 31, 1908	38
8 d.d. ..	*	..	..	£67,211	*	125,354	497,766	*Energy purchased from Belfast Corporation. Data to Dec. 31, 1908	39
45 d.d. ..	675†	702	..	£188,167	£63,000 inc. car shed	1,144,395	8,750,532	*Also Strood, Frindsbury, Delce & Borstal, leased. †Part Energy purch. from Kent El, P, Co. Data to Dec. 31, '09	40
18 d.d., 2 s.d.	*	..	..	£120,000	*	514,278	2,758,822	*Energy purchased from Cheltenham Corporation lighting & traction station. Data to Aug. 16, 1909	41
17 d.d., 1 s.d. (inc. regen.)	1,325*	1,320	154 KW.	£82,848	£118,900	366,102	2,989,707	*Lighting and traction station. Data to March 25, 1910	42
14 d.d. ..	1,000*	300	..	£69,792	£7,000†	282,228	2,450,000	*Lighting and traction station. †Extra outlay for traction	43
12 d.d. ..	*	..	..	£72,500	*	152,000	524,000	*Energy supplied by Dublin United Tramways Co. ..	44
18 d.d. ..	*	..	..	£69,555	*	321,610	1,725,948	*Lighting and traction station. Energy purchased from Corporation at 1½d. per unit. Data to Mar. 31, 1910	45
12 d.d. ..	*	..	..	..	*	297,962	1,949,859	*Energy purchased from Colne Corporation. Data to Dec. 31, 1909	46
35 d.d. ..	2,680*	400 (tr. only)	..	£173,466	*	864,228	5,849,041	*Lighting and traction station. Data to Dec. 31, 1909	47
36 d.d. ..	700	..	..	£197,675		851,401	5,873,427	65-lb. rails Falk welded, 81-lb. rails Thermit welded. Data to Dec. 31, 1909	48
70 d.d. ..	1,750* (tr. only)	650	..	£257,176	*	2,253,710	18,705,604	*Lighting and traction station. Tramways taken over from Company, June, 1906	49
16 s.d. ..	*	306.8	..	£76,269	*	372,596	2,980,068	*Lighting and traction station. Energy purchased from Corp. Electricity Department. Data to Mar. 31, 1910	50
12 d.d. ..	*	..	..	..	*	317,127	2,055,033	*Energy purchased from Dartford U. D. C. Data to Mar. 25, 1908	51
14 d.d., 3 s.d. regen.	900*	300	92 KW.	£85,500	*	234,000	2,388,000	*Lighting and traction station. Data to Mar. 31, 1909..	52
45 d.d., 4 s.d.	1,100*	500	170 KW.	£236,018	£30,000* (tr. only)	1,156,246	9,909,359	*Lighting and traction station. Energy purchased from Electricity Committee. Data to Mar. 31, 1910	53
25 d.d. ..	*	..	..	£162,337	*	590,473	5,410,685	4½ miles leased from Corporation. *Energy purchased from Devonport Corporation. Data to Dec. 31, 1908	54
25 d.d. ..	1,040*	500	..	£91,395	*	488,361	3,411,522	*Lighting and traction station; energy supplied at 1½d. per unit. Data to Mar. 31, 1910	55
21 d.d. ..	209* (tr. only)	..	280 KW.-hours	£62,850	*	308,959	2,624,468	River Light Rly. figures included. *Lighting and traction station. Data to Mar. 31, 1910	56
330 d.d., 8 s.d.	4,800*	2,957	..	£1,992,558	..	7,389,576	51,512,995	*A.C. 2,500v. 3ph. to sub-stations, D.C. to line at 500v. Data to Jan. 1, 1910	57
6 d.d., 1 loco., 18 wagons	240	200	..	£68,854*	..	138,819	423,230	*Including conversion & alteration of gauge. Data to Dec. 31, 1909	58
24 d.d.,35 s.d.	500	..	325 KW.	£375,706	..	912,266	7,649,693	Part power supplied by Dudley Corp., also by Midland Corporation for E. P. D. Data to Dec. 31, 1908	59
6 d.d., 24 comb.	*	741	..	..	*	402,489†	1,842,098†	*Energy purchased from Electric Supply Corporation Ltd. †From Aug. 1, 1908, to Apr. 30, 1909	60
60 d.d., 6 comb.	*	..	..	£380,088	*	1,281,552	16,367,911	*Lighting and traction station. Data to May 15, 1908 ..	61
14 d.d. ..	420	500	..	..	..	369,000	1,732,423	Data to July 31, 1909	62
40 d.d. ..	1,925*	1,454	..	£181,663	£125,769*	1,201,970	16,071,857 (1906)	* Lighting and traction station; energy purchased from Electricity Department. Data to Mar. 31, 1909	63
11 d.d. ..	240*	350	165 KW.†	£69,647	*	..	..	*Energy purchased from Eccles Corporation since Sept., 1907. †With Highfield booster	64
14 d.d., 2 s.d. regen.	*	..	..	£87,754†	£7,428†	317,018	2,324,717	*Energy purchd. from Electy. Dept. †Includes traction plant in pr. station, and cables. Data to Mar. 31, 1910	65
20 d.d. ..	*	..	..	£82,000	£9,000†	..	..	*Lighting and traction station. †Tramways proportion	66
18 d.d. ..	*	..	..	£98,861	*	411,807	3,186,686	Extensions to Grangemouth and Laurieston, 5.45 miles. *Energy purchased from Scottish Central Elec. Power Co.	67
13 d.d. ..	550*	300	..	£43,696 & £25,000	£42,000*	†	†	*Lighting and traction station. †Included in S. Lancs. Tramways Co.'s returns.	68
2 motor, 1 trailer	*	..	..	..	*	..	..	Third-rail electric railway. *Energy supplied by Felixstowe Corporation	69
25 d.d.,15 s.d. 11 comb.	*	..	..	£318,385	*	1,272,957	11,970,002	*Energy purchased from County of Durham E. P. D. Co., Ltd. Data to Dec. 31, 1909	70
5 s.d., 18 tr.	100	90	..	£55,472	..	53,947	128,546	This was the first electric tramway in the United Kingdom. Data to Jan. 1, 1910	71
768 d.d. ..	14,200	8,364	..	£2,589,766	£555,810	20,802,797 (May, 1909)	221,744,569 (May, 1909)	6,500v. 3-ph. to sub-stations. Data to May 31, 1908	72
7 d.d., 1 s.d.	425*	150 (tr. only)	600 A.H.	£54,097	£49,247*	205,878	1,571,997	*Lighting and traction station. Data to end of 1909	73
30 d.d. ..	1,150*	400	..	£144,192 (net).	*	603,211	3,843,553	*Lighting and traction station. Energy purchased from Elec. Dept. at 1d. per unit. Data to Mar. 31, 1910	74
22 d d. ..	750*	..	..	..	..	479,182	2,062,758	*Bulk supply to Gosport & Alverstoke Electric Lighting Co. Data to Sept. 30, 1909	75
16 d.d., 2 s.d.	*	..	..	£98,506	*	£306,961	2,779,697	* Energy purchased from Gravesend Corporation. Data to Dec. 31, 1908	76
40 (1 demi-car)	*	..	..	£233,778	*	658,514	5,857,978	* Energy purchased from Greenock Corporation. Data to Dec. 31, 1908	77
32 d.d. ..	300	..	..	..	..	..	..	Energy purchased from Grimsby Corpn. for lines in Grimsby	78
9 d.d., 1 s.d. 8 trailers	180	100	..	£27,632	..	Car 142,905 Tlrs.25,809	873,720	Refuse destructor takes entire load when refuse available	79
98 d.d., 2 s.d.	4,780*	2,870	660 KW.	£395,878	£258,258*	1,862,068	16,233,755	*Lighting and traction station; tramways supplied at 1d. per unit. Data to Mar. 31, 1910	80
21 d.d. ..	400	300	..	..	..	427,790	2,891,571	Data to Dec. 1909	81
*	†	..	100 KW.	£25,000*	£1,387† (sub. stn.)	149,612	1,188,643	*Cars belong Accrington & Rawtenstall Corpn. †Energy purchd. from Accrington Corpn. Data to Mar. 31, 1910	82
65 d.d. ..	2,100	..	82 KW.	£488,300		1,402,000	8,567,000	Two rotary-converter sub-stations. *2 route miles on Dolter surface-contact system. Data to Dec. 31, 1909.	83
3 s.d. ..	50	..	..	..	..	..	..	Pier Electric Railway. Third rail, angle bar beneath deck. Gas power. Data to April 12, 1910	84
*	900†	400	..	£28,762	£6,496†	288,086	2,187,751	*Rolling stock supplied by Bury & Rochdale; energy by Heywood. †Lg. and tr. station. Data to Mar. 31, 1910	85
75 d.d. ..	2,200	1,790	..	£373,809	£32,626	2,027,077	17,925,058	Data to March 31, 1910	86
116 d.d ..	1,560	1,350	..	£438,384		3,879,116	32,958,883	Data to March 31, 1909	87
26 d.d. (6 bogie cars)	*	..	..	£148,170	*	666,364	7,274,398	*Lighting and traction station. Data to Mar. 31, 1910	88
13 d.d. ..	1,000*	600	..	..	*	239,407	1,858,903	* Energy purchased from Derbyshire and Notts. Electric Power Co. Data to March 31, 1910	89
36 d.d. ..	*	..	..	£114,430	*	644,786	5,006,881	* Lighting and traction station. Data to Mar. 31, 1910	90
									91
39 mr., 48 tr. (s.d. comb.) 2 automob.	1,300	1,337	347 KW.	..	..	363,779 (train miles)	518,655	Data to Sept. 30, 1909	
8 d.d. ..	200	..	..	£41,445	..	36,500	194,826	Open in summer only. Data to October 31, 1909	
59 d.d. ..	1,600*	1,000 (inc. lg.)	60 KW.	..	*	736,145	4,243,338	* Lighting and traction station. Data to Sept. 30, 1909	92
10 d.d. ..	*	..	..	£68,781	*	168,840	1,222,795	*Energy purchased from County of Durham E.P.D. Co., and South Shields Corp. Data to Dec. 31, 1909	93
12 d.d., 2 motor buses	200*	160	..	£46,000	£42,000*	167,915 (9 months)	1,429,887 (9 months)	*Lighting and traction; 200 KW. for traction. Year ends Mar. 31, 1909	94
4 d.d., 9 s.d.	*	..	..	£60,782	*	179,804	725,209	*Energy purchased from Kidderminster & Dist. Elec. Lighting & Traction Co., Ltd. Data for 1908	95

115	MEXBOROUGH, RAWMARSH & SWINTON	
116	MIDDLESBROUGH, STOCKTON & THORNABY	
117	MIDDLESEX & HERTFORDSHIRE	
118	MIDDLETON, ROCHDALE AND OLDHAM	
119	MUSSELBURGH & DISTRICT	
120	NELSON	
121	NEWCASTLE-ON-TYNE ..	
122	NEWPORT (MON.)	
123	NORTHAMPTON	
124	NORWICH	
125	NOTTINCHAM	
126	OLDHAM	
127	OLDHAM, ASHTON & HYDE	
128	PAISLEY, JOHNSTON, RENFREW, BARRHEAD	
129	PENCE, SUTTON, WALL'N., MITCHAM, TTC., W.CR'N.	
130	PERTH	
131	PETERBOROUCH	
132	PLYMOUTH	
133	PLYMOUTH, STONEHOUSE AND DEVONPORT	
134	PONTYPRIDD	
135	PORTSMOUTH	
136	POTTERIES	
137	PRESTON	
138	PURBROOK, COSHAM, W'VILLE AND HORNDEAN	
139	RADCLIFFE	
140	RAWTENSTALL & BACUP	
141	READING	
142	RHONDDA (URBAN DISTRICT)	
143	ROCHDALE, LITTLEBOROUCH & HEYWOOD	
144	ROTHERHAM	
145	ROTHESAY	
146	ST. HELENS & DISTRICT ..	
147	SALFORD	
148	SCARBOROUGH	
149	SEAFORTH, WATERLOO & CROSBY	
150	SHEERNESS & QUEENBOROUCH	
151	SHEFFIELD	
152	SHIPLEY	
153	SMETHWICK	
154	SOUTHAMPTON	
155	SOUTHEND-ON-SEA ..	
156	SOUTH LANCASHIRE ..	
157	SOUTHPORT	
158	SOUTHPORT & BIRKDALE	
159	SOUTHPORT PIER	
160	SOUTH SHIELDS	
161	SOUTH STAFFORDSHIRE*	
162	STALYBRIDGE, HYDE, MOSSLEY, DUKINFIELD	
163	STOCKPORT & DISTRICT	
164	SUNDERLAND	
165	SUNDERLAND DISTRICT ..	
166	SUTTON AND HOWTH ..	
167	SWANSEA	
168	SWINDON	
169	TAUNTON	
170	TORQUAY	
171	TYNEMOUTH & DISTRICT	
172	TYNESIDE	
173	WAKEFIELD & DISTRICT	
174	WALLASEY	
175	WALSALL	
176	WALTHAMSTOW	
177	WALTON-ON-THE-NAZE PIER	
178	WARRINGTON	
179	WEMYSS & DISTRICT ..	
180	WEST BROMWICH	
181	WEST HAM	
182	WEST MIDDLESEX, THAMES VALLEY & WIMBLEDON	
183	WESTON-SUPER-MARE ..	
184	WICAN	
185	WOLVERHAMPTON	
186	WOLVERHAMPTON DISTRICT	
187	WORCESTER	
188	WREXHAM	
189	YARMOUTH	
190	YORK	
191	YORKSHIRE (WOOLLEN DISTRICT)*	

AMWAYS, RAILWAYS AND P

ED KINGDOM.

	Locality.	Lines owned by	Year of opening.	Tramways Manager.	Tramways Electrical Engineer.	Miles of Route.	Gauge.	Weight of Rails per yard. lb.	Motor Cars.	Power St	
										Total Capacity in KW.	Max. load in KW.
96	KILMARNOCK	Kilmarnock Corporation	1904	Alf. H. Burbidge	Alf. H. Burbidge	4.29	4ft. 8½in.	90	14 d.d.	755*	250
97	KIRKCALDY	Kirkcaldy Corporation	1903	O. F. Francis	O. F. Francis	5.25	3ft. 6in.	87	22 d.d.	1,090*	385
98	LANCASTER	Lancaster Corporation	1903	W. A. Tester	W. A. Tester	4	4ft. 8½in.	90	12 d.d.	1,250*	700
99	LEAMINGTON & WARWICK	Leamington and Warwick Electrical Co., Ltd.	1905	R. L. McCulloch (Eng. & Man.)	R. L. McCulloch	3.05	3ft. 6in.	..	12 d.d.	630	..
100	LEEDS	Leeds Corporation	1897	J. B. Hamilton	J. Burbridge	57.5	4ft. 8½in.	100 & 105	281 d.d., 1 s.d.	6,150	5,183
101	LEICESTER	Leicester Corporation	1904	A. F. Lucas	T. R. Smith (Tram. Eng.)	20	4ft. 8½in.	100	140 d.d.	2,500	1,600
102	LEITH	Leith Corporation	1905	F. A. Fitzpayne (Gen. Manager).	A. Peden Rutherford(Bur.El.Eng.)	9	4ft. 8½in.	106.7	37 d.d.	2,232*	320
103	LEYTON	Leyton Urban District Council	1906	F. Schofield	F. Harman Lewis	9.5	4ft. 8½in.	105	60 d.d.	2,700*	1,759
104	LLANDUDNO, RHOS-ON-SEA & COLWYN BAY	Llandudno and Colwyn Bay Electric Railway, Limited	1907	W. H. Moorhouse	.. .. ..	6.60	3ft. 6in.	90	18 s.d.	*	..
105	LINCOLN AND BRACEBRIDGE	Lincoln Corporation	1905	Stanley Clegg	Stanley Clegg	1.75	4ft. 8½in.	100	8 d.d.	290* (tr.only)	185 (tr only)
106	LIVERPOOL	Liverpool Corporation	1898	C. W. Mallins	A.B.Holmes(Cons.) A. Clough (Res.)	62	4ft. 8½in.	95 & 123	519 d.d., 12 s.d.	35,300*	17,245
107	LIVERPOOL—PRESCOT	Lancashire Light Railway Co. Ltd.	1902	J. R. Salter	J. R. Salter	3	4ft. 8½in.	90	7 d.d.	*	..
108	LONDON (COUNTY)	London County Council	1903	A. L. C. Fell	J. H. Rider	85.83	4ft. 8½in.	102 & 105	1120 d.d., 50 s.d.	24,000	17,000
109	LOWESTOFT	Lowestoft Corporation	1903	G. A. Bruce	G. A. Bruce	4	3ft. 6in.	100	15 d.d., 4 s.d.	*	..
110	LUTON	Balfour, Beatty & Co., Ltd., Lessees	1908	J. W. McInnis	W. H. Cooke (Boro' El. Eng.)	5.25	4ft. 8½in.	95	12 d.d.	1,150*	..
111	MAIDSTONE	Maidstone Corporation	1904	F. E. Saunders	F. E. Saunders	5.25	3ft. 6in.	96	17 d.d., 1 s.d., 1 wtr.†	300*	280*
112	MANCHESTER	Manchester Corporation	1901	J. M. McElroy	J. J. McMahon	105	4ft. 8½in.	105	585 d.d., 45 comb.	*	..
113	MANSFIELD & DISTRICT	Mansfield & Dist. Lt. Ry. Co. (controlled by M. & Dist. Tys. Ltd.)	1905	C. R. Walker	C. R. Walker	10	4ft. 8½in.	90	20 d.d.	*	..
114	MERTHYR TYDFIL	Merthyr Electric Traction and Lighting Co., Ltd.	1901	L. W. Dixon (Man. & Eng.)	T. H. Johnson(El. Eng.)*	2.98	3ft. 6in.	75	4 d.d., 12 s.d.	820	401 tr. only
115	MEXBOROUGH, RAWMARSH & SWINTON	Mexborough & Swinton Tramways Co.	1907	Percy Priestly	Percy Priestly	7	4ft. 8½in.	90	20 d.d.	450	..
116	MIDDLESBROUGH, STOCKTON & THORNABY	Imperial Tramways Co.	1898	..	..	9	3ft. 6in.	92.5	50 d.d., 10 comb.	900	..
117	MIDDLESEX & HERTFORDSHIRE	Metropolitan Electric Tramways Ltd.	1904	J. Devonshire (Man. Dir.)	A. H. Pott	51.5	4ft. 8½in.	101	221 d.d., 16 s.d.	*	..
118	MIDDLETON, ROCHDALE AND OLDHAM	Middleton Electric Traction Co., Ltd.	1902	W. F. Endean	.. .. ..	8.5	4ft. 8½in.	90	5 d.d., 18 s.d., 4 comb.	*	..
119	MUSSELBURGH & DISTRICT	Musselburgh and District Electric Light and Traction Co., Ltd.	1904	A. A. Watkins	A. A. Watkins	6½	4ft. 8½in.	90	16 d.d.	600*	400
120	NELSON	Nelson Corporation	1903	D. Helme	D. Helme	2.75	4ft. 0in.	107	6 d.d., 3 s.d. comb.	1,000*	..
121	NEWCASTLE-ON-TYNE	Newcastle-on-Tyne Corporation	1901	Ernest Hatton	Ernest Hatton	31.3	4ft. 8½in.	101	77 d.d., 88 s.d., 22 comb.	5,150	3,300
122	NEWPORT (MON.)	Newport Corporation	1903	H. Collings Bishop	H. Collings Bishop	7.5	4ft. 8½in.	96	43 d.d.	*	..
123	NORTHAMPTON	Northampton Corporation	1904	J. Gottschalk	John F. Cameron	5.5	3ft. 6in.	90	22 d.d.	520	350
124	NORWICH	Norwich Electric Tramways Co.	1900	F. W. Ketley	F. W. Ketley	14.62	3ft. 6in.	65.5	47 d.d. inc. 5 regen.	800	500
125	NOTTINGHAM	Nottingham Corporation	1901	J. Aldworth	H. Talbot	19	4ft. 8½in.	107	125 d.d.	8,576*	..
126	OLDHAM	Oldham Corporation	1900	Lewis Slattery	S. W. Newington	23	4ft. 8½in.	100	57 d.d., 23 s.d.	2,765*	1,485
127	OLDHAM, ASHTON & HYDE	Oldham, Ashton & Hyde Electric Tramway, Ltd.	1899	J. V. Kitchener (Man. Dir.) A. Anderson (Supt.)	E. T. Todd	9.13	4ft. 8½in.	96	12 d.d., 34 s.d.	*	..
128	PAISLEY, JOHNSTON, RENFREW, BARRHEAD	Paisley District Tramways Co.	1904	Fred Coutts	Fred Coutts. H. F. Parshall (Cons.)	15	4ft. 7¾in.	90	50 d.d., 2 s.d.	*	..
129	PENGE, SUTTON, WALL'N., MITCHAM, TTG., W.CR'N.	South Metropolitan Electric Tramways and Lighting Co., Ltd.	1906	A. V. Mason (Gen. Man.)	A. V. Mason	13.09*	4ft. 8½in.	90	51 d.d.	600 (tr. only)	200 (tr. only)
130	PERTH	Perth Corporation	1905	John Lambert	John Lambert	5.8	3ft. 6in.	90	12 d.d.	*	..
131	PETERBOROUCH	Peterborough Electric Traction Co., Ltd.	1903	J. R. Groves	..	5.31	3ft. 6in.	94	14 d.d.	*	..
132	PLYMOUTH	Plymouth Corporation	1899	C. R. Everson	E. G. Okell	4.1	3ft. 6in.	92	26	700*	..
133	PLYMOUTH, STONEHOUSE AND DEVONPORT	Plymouth, Stonehouse & Devonport Tramways Co.	1901	G. H. Moreton	John Glenn	1.5	3ft. 6in.	84	14 d.d.	*	..
134	PONTYPRIDD	Pontypridd Urban District Council	1905	J. E. Teasdel	J. E. Teasdel	5.35	3ft. 6in.	96	20 d.d., 6 s.d.	900*	490 (tr.)
135	PORTSMOUTH	Portsmouth Corporation	1901	W. B. Spaven	V. G. Lironi	15.75	4ft. 7¾in.	96 & 100	100 d.d.	2,075	974
136	POTTERIES	Potteries Electric Traction Co., Ltd.	1899	W. Thom	F. J. Chapple	31.68	4ft. 0in.	87	110 s.d.	2,100	..
137	PRESTON	Preston Corporation	1904	Jos. F. Simpson	Jos. F. Simpson	10	4ft. 8½in.	95	30 d.d.	600	450
138	PURBROOK, COSHAM, W'VILLE AND HORNDEAN	Provincial Tramways Co., Ltd.	1903	J. Fereday Glenn	J. Fereday Glenn J. Glenn (Cons.)	6	4ft. 7¾in.	96	16 d.d.	200*	..
139	RADCLIFFE	Bury Corporation	1905	W. Clough	H. Wilkinson	..	4ft. 8½in.	100	..	490*	310 (tr. only)
140	RAWTENSTALL & BACUP	Rawtenstall Corporation	1909	C. L. Stewart	C. L. Stewart	9	4ft. 0in.	100	16 d.d., 16 regen.	880*	480
141	READING	Reading Corporation	1903	Walter Binns	Walter Binns	7.5	4ft. 0in.	96	36 d.d.	400	500
142	RHONDDA (URBAN DISTRICT)	Rhondda Tramways Co., Ltd.	1908	H. J. Nisbett	H. J. Nisbett	18.5	3ft. 6in.	96	50 d.d. (25 covd.	1,320*	1,110
143	ROCHDALE, LITTLEBOROUCH & HEYWOOD	Rochdale Corporation	1902	J. S. D. Moffet	C. C. Atchison (Boro' El. Eng.)	19.58	4ft. 8½in.	103	34 d.d., 25 comb.	2,176*	517 (tr. only)
144	ROTHERHAM	Rotherham Corporation	1903	Edward Cross	Edward Cross	11.46	4ft. 8½in.	88.5	30 d.d.	1653*	560

COPYRIGHT

ID POWER COMPANIES

Motor Cars.	Power Station. Total Capacity in KW.	Power Station. Max. load in KW.	Power Station. Battery max. discharge.	Capital Outlay on Tramway and Rolling Stock.	Capital Outlay on Power Station.	Annual Electric Car Mileage.	Passengers Carried per Annum.	Remarks.	
4 d.d. ..	755*	250	..	£55,580	*	299,000	2,061,000	*Lighting and traction station. Data to May 15, 1910..	96
2 d.d. ..	1,090*	385	200 KW.	£89,447	*	431,892	4,666,329	*Lighting & traction station. Through running in service with Wemyss Tramways. Data to May 15, 1909	97
2 d.d. ..	1,250*	700	..	£43,330	£37,600*	166,894	1,335,534	*Lighting and traction station. Data to Mar. 25, 1910	98
2 d.d. ..	630	..	..	..	£106,411	179,344	1,082,491	Data to Dec. 31, 1908	99
31 d.d., 1 s.d.	6,150	5,183	..	£1,222,907*	£197,486	8,131,022	78,385,015	*Including purchase of lines. Data to Mar. 31, 1910 ..	100
40 d.d. ..	2,500	1,600	450 KW.	£683,519	£96,754	3,334,156	27,411,286	Data to Dec. 31, 1908	101
7 d.d. ..	2,232*	320	..	£234,710	..	959,829 (estd.)	8,105,918 (estd.)	*Lighting and traction station. Data to May 15, 1910..	102
0 d.d. ..	2,700*	1,759	450 KW.	£307,884	£91,000*	1,472,929	14,260,980	*Lighting and traction station. Data to March 31, 1910	103
3 s.d. ..	*	..	..	†	..	247,843 (1908-9)	1,356,323 (1908-9)	*Energy purchased from Llandudno U.D.C. †Not at present ascertainable. Data to Nov. 30, 1909	104
d.d. ..	290* (tr.only)	185 (tr. only)	..	£44,999	£65,151*	157,268	1,599,751	"G.B." surf. cont. system. *Lg. & tr. station. Energy purchased from Electricity Dept. Data to Mar. 31, 1910	105
19 d.d., 12 s.d.	35,300*	17,245	..	£1,969,697	£2,099,709*	11,952,373	121,532,940	*Lighting and traction stations. Energy purchased from Electric Supply Dept. Data to Dec. 31, 1909	106
d.d. ..	*	..	..	£50,832	*	108,060	493,037	*Energy purchased from Prescot lighting and traction station. Data to Dec. 31, 1909	107
1120 d.d., 50 s.d.	24,000	17,000	..	£6,305,400 (estd.)	£600,000 (to date)	31,962,784	344,705,937	Data to Mar. 31, 1909	108
d.d., 4 s.d.	*	..	..	£79,235	*	332,699	2,172,546	*Lighting and traction station. †Energy purchased from Electricity Supply Dept. Data to Sept. 30, 1909	109
2 d.d. ..	1,150*	..	..	£63,000	*	..	..	*Energy purchased from Luton Corporation	110
d.d., 1.s.d., 1 w tr.†	300*	280*	150 KW.	£81,708	£55,000*	309,476	2,184,276	*Lighting and traction station. †1 s.d. demi., 3 d.d. regen.	111
35 d.d., 45 comb.	*	..	..	£1,957,594	*	17,161,774	159,049,096	All cars fitted with Ferranti mtrs. Data to Mar. 31, 1909 *Lighting and traction stations. Energy purchased from Electricity Committee. Data to March 31, 1910	112
0 d.d. ..	*	..	..	£106,266	*	445,855	2,826,933	*Energy purchased from Mansfield Corporation. Data to Dec. 31, 1909	113
d.d., 12 s.d.	820	401 tr. only	300 KW.	£58,512	£50,026	241,491	1,951,231	Lighting and traction station. *H. King (Tr. Supt.) Data to Dec. 31, 1909	114
0 d.d. ..	450	..	..	..	..	..	..	.. ..	115
0 d.d., 10 comb.	900	..	..	..	..	..	10,000,000 approx.	.. ..	116
d.d., 16 s.d.	*	..	..	..	*	7,033,186	62,357,947	*Energy purchased from North Metropolitan Electric Power Supply Co. Data to Dec. 31, 1909	117
d.d., 18 s.d., 4 comb.	*	..	..	£159,266	*	427,826	3,003,871	*Energy purchased from Middleton Corporation. Data for 1909	118
5 d.d. ..	600*	400	..	£122,951	*	322,273	2,224,024	Three motor omnibuses. *Lighting & traction station. Data to Dec., 1909	119
d.d., 3 s.d. comb.	1,000*	..	..	..	*	200,115	2,001,588	*Lighting and traction station. Data to March 31, 1910	120
d.d., 88 ., 22 comb.	5,150	3,300	1,200 KW.	£968,831	£201,403	4,430,085	44,516,958	Data to March 31, 1910	121
5 d.d. ..	*	..	..	£190,261	*	785,969	7,958,760	*Lighting and traction station. Data to March 31, 1909	122
3 d.d. ..	520	350	150 KW.	£115,165	£12,957	588,349	5,790,804	Data to Mar. 31, 1910	123
7 d.d. inc. 5 regen.	800	500	..	£330,000		1,002,258	7,371,524	Data to June 30, 1909	124
35 d.d. ..	8,576*	..	100 KW.	£613,868	*	3,340,549	34,647,238	*Lighting & traction station. Data to Mar. 31, 1910 ..	125
7 d.d., 23 s.d.	2565*	1,485	..	£440,423	£223,341*	1,978,150	20,062,367	*Lighting and traction station. Data to Mar. 25, 1908..	126
2 d.d., 34 s.d.	*	..	..	£155,304	*	773,354	5,780,066	*Energy purchased from Ashton Corporation. Data to Dec. 31, 1909	127
0 d.d., 2 s.d.	*	..	..	..	*	1,000,000	11,000,000	*Energy purchased from Paisley Corporation. Data to April 13, 1910	128
d.d. ..	600 (tr. only)	200 (tr. only)	..	£405,364	£81,437	920,155	6,893,162	Lg. & tr. st. Energy also purch. from C'n. and Beck'm. *Also 2.6 m. thro' rg. Croydon. Data to Dec. 31, 1910	129
2 d.d. ..	*	..	..	£55,251	*	243,524	1,720,856	*Energy purchased from Perth Corporation. Data to May 15, 1909	130
4 d.d. ..	*	..	..	£62,897	*	240,817	1,287,995	*Energy purchased from Peterborough Corporation. Data to Dec. 31, 1908	131
6	700*	..	1,140 KW.-hrs.	£117,000	*	..	..	*Lighting and traction station	132
4 d.d. ..	*	..	..	..	*	..	..	*Energy purchased from Devonport Corporation ..	133
0 d.d., 6 s.d.	900*	490 (tr.)	495 KW.	£131,648	*	413,137	4,480,090	*Lighting and traction. Data to Mar. 31, 1909	134
00 d.d. ,,	2,075	974	..	£599,459*	£51,868	2,291,767	23,053,717	*Including purchase. Data to Mar. 31, 1910	135
10 s.d. ..	2,100	..	..	£530,123		2,278,172	18,389,004	Data for 1908	136
0 d.d. ..	600	450	..	£187,000		901,374	8,484,580	Data to Mar. 31, 1910	137
6 d.d. ..	200*	..	500 A.	..	..	270,727	800,231	J. B. Glenn, Sec. and Man. Dir. *Diesel oil engines. Data to Sept. 30, 1909	138
..	490*	310 (tr. only)	..	..	*	365,635	2,978,109	*Lg. and tr. Energy supplied by Radcliffe U.D.C.; tramways worked by Bury Corporn. Data to Mar. 31, 1910	139
3 d.d., 16 regen.	880*	480	140 KW.	£142,066	£34,381	343,976	2,393,705	*Energy purchased from Electricity Dept. Figures for 10 months. Data to Mar. 31, 1910	140
d.d. ..	400	500	..	£190,890	£30,000 (exc. site)	919,852	7,883,161	Data to Mar. 31, 1910	141
0 d.d. (25 covd.	1,320*	1,110	..	£250,000	£55,000*	1,064,871	9,036,645	*Energy purchased from the Rhondda Tramways Elec. Sup. Co., Ltd., at .94d. per unit, inc. Data to Dec. 31, '09	142
4 d.d., 25 comb.	2,176*	517 (tr. only)	..	£348,510†	£66,414	1,248,362	10,247,338	*Lg. & tr. st. †Inc. £75,000, purchase of Bury, Rochdale & Oldham Trys. in Rochdale dist. Data to Mar. 31, 1909	143
0 d.d. ..	1653*	560	..	£185,948	£12,958*	665,302	6,689,873	*Lighting and traction station; plant available for both purposes. Data to Mar. 31, 1910	144

115	MEXBOROUGH, RAWMARSH & SWINTON	Mexborough & Swinton Tramways Co.	1907	Percy Priestly ..	Percy Priestly ..	7	4ft. 8½in.	90	20 d.d. ..	420	..
116	MIDDLESBROUGH, STOCKTON & THORNABY	Imperial Tramways Co.	1898	..	..	9	3ft. 6in.	92.5	50 d.d., 10 comb.	900	..
117	MIDDLESEX & HERTFORDSHIRE	Metropolitan Electric Tramways Ltd.	1904	J. Devonshire .. (Man. Dir.)	A. H. Pott ..	51.5	4ft. 8½in.	101	221 d.d., 16 s.d.	*	..
118	MIDDLETON, ROCHDALE AND OLDHAM	Middleton Electric Traction Co., Ltd.	1902	W. F. Endean ..	.. .. ..	8.5	4ft. 8½in.	90	5 d.d., 18 s.d., 4 comb.	*	..
119	MUSSELBURCH & DISTRICT	Musselburgh and District Electric Light and Traction Co., Ltd.	1904	A. A. Watkins	A. A. Watkins ..	6½	4ft. 8½in.	90	16 d.d. ..	600*	400
120	NELSON	Nelson Corporation	1908	D. Helme ..	D. Helme ..	2.75	4ft. 0in.	107	6 d.d., 3 s.d. comb.	1,000*	..
121	NEWCASTLE-ON-TYNE ..	Newcastle-on-Tyne Corporation..	1901	Ernest Hatton ..	Ernest Hatton ..	31.3	4ft. 8½in.	101	77 d.d., 88 s.d., 22 comb.	5,150	3,300
122	NEWPORT (MON.)	Newport Corporation	1908	H. Collings Bishop	H. Collings Bishop	7.5	4ft. 8½in.	96	45 d.d. ..	*	..
123	NORTHAMPTON	Northampton Corporation ..	1904	J. Gottschalk ..	John F. Cameron	5.5	3ft. 6in.	90	22 d.d. ..	520	350
124	NORWICH	Norwich Electric Tramways Co...	1900	F. W. Ketley ..	F. W. Ketley ..	14.62	3ft. 6in.	65.5	47 d.d. inc. 5 regen.	800	500
125	NOTTINGHAM	Nottingham Corporation	1901	J. Aldworth ..	H. Talbot ..	19	4ft. 8½in.	107	125 d.d. ..	8,576*	..
126	OLDHAM	Oldham Corporation	1900	Lewis Slattery ..	S. W. Newington	23	4ft. 8½in.	100	57 d.d., 23 s.d.	2,565*	1,485
127	OLDHAM, ASHTON & HYDE	Oldham, Ashton & Hyde Electric Tramway, Ltd.	1899	J. V. Kitchener (Man. Dir.) A. Anderson (Supt.)	E. T. Todd ..	9.18	4ft. 8½in.	96	12 d.d., 34 s.d.	*	..
128	PAISLEY, JOHNSTON, RENFREW, BARRHEAD	Paisley District Tramways Co. ..	1904	Fred Coutts ..	Fred Coutts. H. F. Parshall (Cons.)	15	4ft. 7½in.	90	50 d.d., 2 s.d.	*	..
129	PENGE, SUTTON, WALL'N., MITCHAM, TTC., W.CR'N.	South Metropolitan Electric Tramways and Lighting Co., Ltd.	1906	A. V. Mason (Gen. Man.)	A. V. Mason ..	13.09*	4ft. 8½in.	90	51 d.d. ..	600 (tr. only)	200 (tr. only)
130	PERTH	Perth Corporation	1905	John Lambert ..	John Lambert ..	5.8	3ft. 6in.	90	12 d.d. ..	*	..
131	PETERBOROUCH	Peterborough Electric Traction Co., Ltd.	1903	J. R. Groves ..	..	5.31	3ft. 6in.	94	14 d.d. ..	*	..
132	PLYMOUTH	Plymouth Corporation	1899	C. R. Everson ..	E. G. Okell ..	4.1	3ft. 6in.	92	26	700*	..
133	PLYMOUTH, STONEHOUSE AND DEVONPORT	Plymouth, Stonehouse & Devonport Tramways Co.	1901	G. H. Moreton ..	John Glenn ..	1.5	3ft. 6in.	84	14 d.d. ..	*	..
134	PONTYPRIDD	Pontypridd Urban District Council	1905	J. E. Teasdel ..	J. E. Teasdel ..	5.35	3ft. 6in.	96	20 d.d., 6 s.d.	900*	490 (tr.)
135	PORTSMOUTH	Portsmouth Corporation	1901	W. R. Spaven ..	V. G. Lironi ..	15.75	4ft. 7½in.	96 & 100	100 d.d. ..	2,075	974
136	POTTERIES	Potteries Electric Traction Co., Ltd.	1899	W. Thom ..	F. J. Chapple ..	31.68	4ft. 0in.	87	110 s.d. ..	2,100	..
137	PRESTON	Preston Corporation	1904	Jos. F. Simpson	Jos. F. Simpson	10	4ft. 8½in.	95	30 d.d. ..	600	450
138	PURBROOK, COSHAM, W'VILLE AND HORNDEAN	Provincial Tramways Co., Ltd. ..	1903	J. Fereday Glenn	J. Fereday Glenn J. Glenn (Cons.)	6	4ft. 7½in.	96	16 d.d. ..	200*	..
139	RADCLIFFE	Bury Corporation	1905	W. Clough ..	H. Wilkinson ..	..	4ft. 8½in.	100	..	490*	310 (tr. only)
140	RAWTENSTALL & BACUP	Rawtenstall Corporation	1909	C. L. Stewart ..	C. L. Stewart ..	9	4ft. 0in.	100	16 d.d., 16 regen.	880*	480
141	READING	Reading Corporation	1903	Walter Binns ..	Walter Binns ..	7.5	4ft. 0in.	96	36 d.d. ..	400	500
142	RHONDDA (URBAN DISTRICT)	Rhondda Tramways Co., Ltd. ..	1908	H. J. Nisbett ..	H. J. Nisbett ..	18.5	3ft. 6in.	96	50 d.d. (25 covd.	1,320*	1,110
143	ROCHDALE, LITTLEBOROUCH & HEYWOOD	Rochdale Corporation	1902	J. S. D. Moffet	C. C. Atchison.. (Boro' El. Eng.)	19.58	4ft. 8½in.	103	34 d.d., 25 comb.	2,176*	517 (tr. only)
144	ROTHERHAM	Rotherham Corporation	1903	Edward Cross ..	Edward Cross ..	11.46	4ft. 8½in.	88.5	30 d.d. ..	1653*	560
145	ROTHESAY	Rothesay Tramways Co., Ltd. ..	1902	A. Robertson ..	H. H. Hill ..	4.87	3ft. 6in.	97	20	350	..
146	ST. HELENS & DISTRICT..	St. Helens Cor. (leased to New St. Helens & Dist. Tramway Co., Ltd.)	1900	J. R. Salter .. (Man. Dir.)	E. M. Hollingsworth	20	4ft. 8½in.	92	44 d.d. ..	*	..
147	SALFORD	Salford Corporation	1901	G. W. Holford ..	(Vacant) ..	41	4ft. 8½in.	103	190 d.d., 10 comb.	6,400*	..
148	SCARBOROUCH	Scarborough Tramways Co. ..	1904	Walter E. Nicoll	Walter E. Nicoll	4.5	3ft. 6in.	90	22 d.d., inc. 7 regen.	*	..
149	SEAFORTH, WATERLOO & CROSBY	Liverpool Overhead Railway Co.	1900	E. J. Neachell ..	E. J. Neachell ..	2.5	4ft. 8½in.	92½	12 d.d., 2 s.d.	160 (substn.)	..
150	SHEERNESS & QUEENBOROUCH	Sheerness and District Electric Power and Traction Co., Ltd.	1903	G. L. Kirk ..	G. L. Kirk ..	2.5	3ft. 6in.	94	8 d.d. ..	700*	387
151	SHEFFIELD	Sheffield Corporation	1899	A. B. Fearnley ..	H. E. Yerbury ..	39.80	4ft. 8½in.	110	211 d.d., 53 s.d. 16 st. cars, etc.	5,725	4,500
152	SHIPLEY	Shipley Urban District Council*	1902	C. J. Spencer ..	S. D. Schofield..	6	4ft. 0in.	98	*	1,170†	621
153	SMETHWICK	Birmingham and Midland Tramways, Ltd.	1904	R. W. Cramp ..	R. Humphries (try.) S. A. Mahood pr.)	12.10	3ft. 6in.	90 & 94	50 d.d., 8 s.d.	4,500*	2,300
154	SOUTHAMPTON	Southampton Corporation ..	1900	H. F. Street ..	H. F. Street ..	11	4ft. 8½in.	98	49 d.d. ..	1,960*	..
155	SOUTHEND-ON-SEA ..	Southend Corporation	1901	Robert Birkett..	Robert Birkett ..	7.5	3ft. 6in.	90	25 d.d. ..	*	432
156	SOUTH LANCASHIRE ..	South Lancashire Tramways Co.	1902	J. R. Salter ..	J. R. Salter ..	39	4ft. 8½in.	90	82 d.d., 1 s.d.	2,750*	1,500
157	SOUTHPORT	Southport Corp. (part leased to Southport & Birkdale Tram. Co.)	1900	T. J. Kendrew ..	A. S. Black .. (Boro' Elec. Eng.)	Cor. 8.5 Co. 5.2	4ft. 8½in.	87, 90, & 101	17 d.d., 1 s.d. 8 comb.	2,350*	1,435
158	SOUTHPORT & BIRKDALE	Southport Tramways Co., Ltd. ..	1901	J. Lloyd.. ..	H. Bentham ..	8.17	4ft. 8½in.	87	20 d.d. (1 regen.) 1s.d. (demi-car)	*	..
159	SOUTHPORT PIER	Southport Pier Co., Ltd.	1905	W. H. Scott ..	.. .. ..	0.6	3ft. 6in.	..	3 s.d. ..	*	..
160	SOUTH SHIELDS	South Shields Corporation ..	1906	Pier & Tram. Man. Lionel E. Harvey	J. H. Cawthra ..	10.25	4ft. 8½in.	95	35 d.d. ..	1,100 tr*	..
161	SOUTH STAFFORDSHIRE*	South Staffs. Tramways Lessee Co.	1902	R. W. Cramp .. (Gen. Man.)	.. .. ..	18.97	3ft. 6in.	90 & 96	30 d.d. ..	..	..
162	STALYBRIDGE, HYDE, MOSSLEY, DUKINFIELD	Stalybridge, Hyde, Mossley and Dukinfield Tr. & Elec. Board	1904	Frank Schofield	R. Blackmore ..	21	4ft. 8½in.	99	40 d.d., 10 s.d. 10 comb.	7,500	..
163	STOCKPORT & DISTRICT	Stockport Corporation	1901	A. T. Eardley ..	R. Lomax ..	15.5	4ft. 8½in.	105 & 99	50 d.d. ..	1,600*	900
164	SUNDERLAND	Sunderland Corporation	1900	A. R. Dayson ..	A. R. Dayson ..	19.54	4ft. 8½in.	96	58 d.d., 8 s.d. 4 comb.	*	..
165	SUNDERLAND DISTRICT ..	Sunderland District Electric Tramways, Ltd.	1905	G. Stratton ..	G. Stratton ..	14.5	4ft. 8½in.	90	33 d.d. ..	*	..
166	SUTTON AND HOWTH ..	Great Northern Ry. Co. (Ireland)	1901	H. Plews (Gen. Man. G.N.R.I.)	A. W. Whieldon	5.37	5ft. 3in.	72	10 d.d., 1 s.d.	475	470
167	SWANSEA	Swansea Improvements & Tramway Co.	1900	D. James ..	A. Johnston ..	12.43*	4ft. 8½in.	87 & 95	28 d.d., 30 s.d. 12 comb.	640	597
168	SWINDON	Swindon Corporation	1904	T. Medcalf ..	A. Dimmack ..	3.7	3ft. 6in.	105	12 d.d. ..	900*	200 (tr. only)
169	TAUNTON	Taunton Electric Traction Co., Ltd.	1901	F. J. Ayliffe ..	.. .. ..	1.25	3ft. 6in.	90	6 s.d. ..	*	..
170	TORQUAY	Torquay Tramways Co., Ltd. ..	1907	Harry Holliday	.. .. ..	8.41	3ft. 6in.	90	18 d.d. ..	*	..
171	TYNEMOUTH & DISTRICT	Tynemouth and District Electric Traction Co., Ltd.	1901	R. Simpson ..	.. .. ..	4.21	3ft. 6in.	90	21 d.d. ..	*	..
172	TYNESIDE	Tyneside Tramways & Tramroads Co.	1902	J. C. Little .. (Sec. & Res. Man.)	F. H. Briggs ..	11	4ft. 8½in.	95	24 d.d. ..	*	..
173	WAKEFIELD & DISTRICT	Wakefield & District Light Railway Co.	1904	H. England ..	C. J. Jewell ..	24.69	4ft. 8½in.	96	67 d.d. ..	1,600	1,431
174	WALLASEY	Wallasey Urban District Council	1902	R. R. Greene ..	J. A. Crowther ..	8.72	4ft. 8½in.	98	50 d.d. ..	1,100*	825
175	WALSALL	Walsall Corporation	1904	R. L. Horsfield..	A. S. Barnard ..	13.5	3ft. 6in.	90 & 92	32 d.d. ..	1,730*	1,026
176	WALTHAMSTOW	Walthamstow Urban District Council	1905	Wm. Murray ..	G. R. Spurr ..	9	4ft. 8½in.	100	32 d.d. ..	*	..
177	WALTON-ON-THE-NAZE PIER	Coast Development Corporation, Ltd.	1898	T. Faiers ..	E. A. Lambert ..	0.5	3ft. 6in.	36	1 motor car, 2 trailers	..	..
178	WARRINGTON	Warrington Corporation	1902	J. Telfer ..	F. V. L. Mathias	6.5	4ft. 8½in.	90	21 d.d. ..	2,150*	1,301
179	WEMYSS & DISTRICT ..	Wemyss and District Tramways Co., Ltd.	1906	Major W. T. J. Marshall	R. Richardson ..	7.5	3ft. 6in.	95 & 97	17 s.d. ..	*	..
180	WEST BROMWICH	South Staffordshire (Lessee Co.)	1902	R. W. Cramp ..	W. A. Jackson..	7	3ft. 6in.	97½	30 d.d. ..	1,550*	742 (tr. only)
181	WEST HAM	West Ham Corporation	1904	H. E. Blain ..	.. .. ..	15	4ft. 8½in.	100	106 d.d., 2 water cars	11,400*	1,505
182	WEST MIDDLESEX, THAMES VALLEY & WIMBLEDON	London United Tramways, Ltd	1901	A. H. Stanley ..	.. .. ..	55.5	4ft. 8½in.	92½ & 100	340 d.d. ..	3,500	..
183	WESTON-SUPER-MARE ..	Weston-super-Mare and District Electric Supply Co., Ltd.	1902	G. Charlton ..	G. Charlton ..	3	4ft. 8½in.	90	8 d.d., 4 s.d.	1,100*	369
184	WIGAN	Wigan Corporation	1901	James Slevin ..	James Slevin ..	24.87	3ft. 6in. & 4ft. 8½in.	105	13 d.d., 54 s.d.	1,140*	..
185	WOLVERHAMPTON	Wolverhampton Corporation ..	1902	W. A. Luntley .. (Gen. Man.)	C. Shawfield (Cons.) H. Vickers (El. Eng.)	13.5	3ft. 6in.	91 & 96	34 d.d., 4 s.d. 11 comb.	2,900* (tr. only)	1,300
186	WOLVERHAMPTON DISTRICT	Wolverhampton District Electric Tramways, Ltd.	1900	R. W. Cramp .. (Gen. Man.)	.. .. ..	14.69	3ft. 6in.	94	32 d.d. ..	*	..
187	WORCESTER	Worcester Electric Traction Co.	1904	J. R. Groves ..	.. .. ..	5.86	3ft. 6in.	94	15 d.d. ..	*	..
188	WREXHAM	Wrexham and District Electric Tramways, Ltd.	1903	A. A. Hawkins ..	.. .. ..	4.28	3ft. 6in.	97	10 d.d. ..	*	..
189	YARMOUTH	Yarmouth Corporation	1902	F. L. Turner ..	G. Bryant ..	10.5	3ft. 6in.	90	35 d.d. ..	400*	..
190	YORK	York Corporation	1910	J. W. Hame ..	J. W. Hame ..	5.87	3ft. 6in.	100	18 d.d. ..	1,860	1,035
191	YORKSHIRE (WOOLLEN DISTRICT)*	Yorkshire (W. D.) Electric Tramways, Ltd.	1908	E. A. Paris .. (Man. Dir.)	R. C. Goldston..	22.25	4ft. 8½in.	94	50 d.d., 16 s.d. 3 regen.	†	about 1,600

d.d. ..	450	..	..	..	..	..	..	.. ..	115
d.d., 10 comb.	900	..	..	..	..	..	10,000,000 approx.	.. ..	116
d.d., 16 s.d.	*	..	..	..	*	7,033,186	62,357,947	*Energy purchased from North Metropolitan Electric Power Supply Co. Data to Dec. 31, 1909	117
d., 18 s.d., comb.	*	..	..	£159,266	*	427,826	3,003,871	*Energy purchased from Middleton Corporation. Data for 1909	118
d.d. ..	600*	400	..	£122,951	*	322,273	2,224,024	Three motor omnibuses. *Lighting & traction station. Data to Dec., 1909	119
d., 3 s.d. comb.	1,000*	..	..	..	*	200,115	2,001,538	*Lighting and traction station. Data to March 31, 1910	120
d.d., 88 , 22 comb.	5,150	3,300	1,200 KW.	£968,831	£201,403	4,480,085	44,516,958	Data to March 31, 1910	121
d.d. ..	*	..	..	£190,261	*	785,969	7,958,760	*Lighting and traction station. Data to March 31, 1909	122
d.d. ..	520	350	150 KW.	£115,165	£12,957	588,349	5,790,804	Data to Mar. 31, 1910	123
d.d. inc. regen.	800	500	..	£330,000		1,002,258	7,371,524	Data to June 30, 1909	124
d.d. ..	8,576*	..	100 KW.	£613,863	*	3,340,549	34,647,338	*Lighting & traction station. Data to Mar. 31, 1910 ..	125
d.d., 23 s.d.	2,565*	1,485	..	£440,423	£223,341*	1,978,150	20,082,867	*Lighting and traction station. Data to Mar. 25, 1908..	126
d.d., 34 s.d.	*	..	..	£155,304	*	773,854	5,730,066	*Energy purchased from Ashton Corporation. Data to Dec. 31, 1909	127
d.d., 2 s.d.	*	..	..	..	*	1,000,000	11,000,000	*Energy purchased from Paisley Corporation. Data to April 13, 1910	128
d.d. ..	600 (tr. only)	200 (tr. only)	..	£405,364	£81,437	920,155	6,893,162	Lg. & tr. st. Energy also purch. from C'n. and Beck'm. *Also 2.6 m. thro' rg. Croydon. Data to Dec. 31, 1910	129
d.d. ..	*	..	..	£55,251	*	243,524	1,720,356	*Energy purchased from Perth Corporation. Data to May 15, 1909	130
d.d. ..	*	..	..	£62,897	*	240,817	1,287,995	*Energy purchased from Peterborough Corporation. Data to Dec. 31, 1908	131
.. ..	700*	..	1,140 KW.-hrs.	£117,000	*	..	..	*Lighting and traction station	132
d.d. ..	*	..	..	..	*	..	..	*Energy purchased from Devonport Corporation ..	133
d.d., 6 s.d.	300*	490 (tr.)	495 KW.	£131,643	*	418,137	4,480,090	*Lighting and traction. Data to Mar. 31, 1909	134
d.d. ,,	2,075	974	..	£599,459*	£51,368	2,291,767	23,053,717	*Including purchase. Data to Mar. 31, 1910	135
s.d. ..	2,100	..	..	£530,123		2,278,172	18,389,004	Data for 1908	136
d.d. ..	600	450	..	£187,000		901,374	8,484,589	Data to Mar. 31, 1910	137
d.d. ..	200*	..	500 A.	..	..	270,727	800,221	J. B. Glenn, Sec. and Man. Dir. *Diesel oil engines. Data to Sept. 30, 1909	138
..	490*	310 (tr. only)	..	..	*	365,635	2,978,109	*Lg. and tr. Energy supplied by Radcliffe U.D.C.; tramways worked by Bury Corporn. Data to Mar. 31, 1910	139
d.d., 16 egen.	830*	480	140 KW.	£142,066	£34,381	343,976	2,393,705	*Energy purchased from Electricity Dept. Figures for 10 months. Data to Mar. 31, 1910	140
d.d. ..	400	500	..	£190,890	£30,000 (exc. site)	919,852	7,888,161	Data to Mar. 31, 1910	141
d.d. (25 covd.	1,320*	1,110	..	£250,000	£55,000*	1,064,871	9,036,645	*Energy purchased from the Rhondda Tramways Elec. Sup. Co., Ltd., at .94d. per unit, inc. Data to Dec. 31, '09	142
d.d., 25 omb.	2,176*	517 (tr. only)	..	£348,510†	£66,414	1,248,362	10,247,338	*Lg. & tr. st. †Inc. £75,000, purchase of Bury, Rochdale & Oldham Trys. in Rochdale dist. Data to Mar. 31, 1909	143
d.d. ..	1653*	560	..	£135,948	£12,958*	665,302	6,689,873	*Lighting and traction station; plant available for both purposes. Data to Mar. 31, 1909	144
.. ..	350	..	350 A.H.	£123,117		222,475	1,049,872	Data for 1908	145
d.d. ..	*	..	..	£30,000	*	1,112,547	6,054,865	*Energy purchased from St. Helens Corporation. Data to Dec. 31, 1909	146
d.d., 10 omb.	6,400*	..	1,200 A.H.	£71,588	*	5,647,428	45,940,775	*Lighting and traction station. Data to March 31, 1910	147
d.d., inc. regen.	*	..	..	£69,580	*	195,326	1,253,805	*Energy purchased from Scarborough Electric Supply Co. Data to Dec. 31, 1909	148
d., 2 s.d.	160 (substn.)	..	1,300 A.H.	£28,917	*	281,911	2,290,611	*Energy from Liverpool Overhead Ry. power station. Data to Dec. 31, 1909	149
d. ..	700*	337	..	£83,145	*	118,201	811,147	Bow collector. *Lighting and traction station. Data to Dec. 31, 1908	150
d., 53 s.d. cars, etc.	5,725	4,500	..	inclusive £1,150,915*	£155,105*	7,459,911	78,620,798	*Data to Mar. 25, 1909; other data to Mar. 25, 1910 ..	151
*	1,170†	621	150 KW.	..	£68,560†	*	*	*Leased to Bradford Corporation. †Lighting and traction station. Data to Mar. 31, 1909	152
d., 8 s.d.	4,500*	2,300	14.5 KW.	£351,536	£115,228*	997,400	11,239,016	*Lighting and traction station. Data to Dec. 31, 1909..	153
d.d. ..	1,360*	..	1,500 KW.	£200,678	*	1,157,451	10,121,887	*Lighting and traction station. Data for 1907-8 ..	154
d. ..	*	432	..	£84,653	*	445,570	4,975,907	*Lighting and traction station. Traffic superintendent J. Daniels. Data to Mar. 31, 1909	155
d., 1 s.d.	2,750*	1,500	..	£508,000	£90,000*	2,147,608	12,954,754	*Lighting and traction station. Data to Dec. 31, 1909..	156
d., 1 s.d. comb.	2,350*	1,435	600 KW.	£118,483	*	454,734	4,150,081	*Lighting and traction station. Data to Mar. 31, 1908	157
(1 regen.) (demi-car)	*	..	..	£84,110 Coy. £74,000 Cor.	*	410,264	2,640,694	*Energy purchased from Southport Corp. and Birkdale Dist. Elec. Supply Co., Ltd. Data to Dec. 31, 1909	158
d. ..	*	..	..	..	*	..	..	Third-rail system. *Energy supplied by Southport Corporation	159
d. ..	1,100 tr*	..	..	£169,390	*	807,327	7,273,776	*Lighting and traction station. Data to Mar. 31, 1910	160
d. ..	..	..	..	£166,497	..	1,059,466	9,118,337	*W. Bromwich, Wednesbury, Dudley, Tipton, Handsworth, Tarlaston. †Energy purchd. Data to 31.12.'09.	161
d., 10 s.d. comb.	7,500	..	750 A.H.	£278,866	£227,557*	1,248,835	10,241,544	*Lighting and traction station. Data to Mar. 31, 1909	162
d. ..	1,600*	900	..	£191,836	£39,099*	..	..	*Lighting & traction station. Energy supplied at 1½d. per unit. Data for 1907-8	163
d., 8 s.d. comb.	*	..	..	£299,744	*	1,461,592	14,380,214	*Energy purchased from Corporation Electricity Department. Data to Mar. 31, 1910	164
d. ..	*	..	..	..	*	664,646	3,734,681	*Energy purchased from Durham Collieries Electric Power Co. Data to Oct. 31, 1909	165
d., 1 s.d.	475	470	150 KW.	..	..	85,000	..	Feeder for steam line from Dublin to Howth. F. A. Campion, Chief Engineer. Data for 1908	166
d., 30 s.d. comb.	640	597	..	£264,476 inc. purch.	..	1,052,067	8,579,871	*7 miles leased, and part of energy purchased, from Swansea Corporation. Data to Dec. 31, 1909	167
d. ..	900*	200 (tr. only)	..	£44,177	*	210,480	2,013,529	*Lighting and traction station. Energy purchased from Elec. Department. Data to March 31, 1910	168
. ..	*	..	..	£27,418	*	99,381	513,381	*Energy purchased from Taunton Corporation. Data to Dec. 31, 1908	169
d. ..	*	..	..	..	*	370,000	2,710 000	Dolter surf. cont. system. *Energy purchased from Torquay Corporation. Data to Dec. 31, 1909.	170
d. ..	*	..	..	£97,915	*	273,805	2,044,034	*Energy purchased from Corporation of Tynemouth. Data to Dec. 31, 1909	171
d. ..	*	..	..	£307,745	*	687,719	4,375,866	*Energy supplied by Newcastle-upon-Tyne Elec. Supply Co., Ltd., & Tynemouth Corp. Data to Dec. 31, 1909	172
d. ..	1,600	1,481	100	£482,389 (1908)	£61,247 (1908)	1,771,635	8,817,229	Data to Dec. 31, 1909	173
d. ..	1,100*	825	..	£151,649	£102,414*	982,001	8,977,726	*Lighting and traction station. Data to Mar. 31, 1909	174
d. ..	1,730*	1,026	..	£165,141	£17,000*	646,491	4,859,585	*Lighting and traction station. Energy purchased from Walsall Corporation. Data to Dec. 31, 1909	175
d. ..	*	..	..	£180,000	*	879,756	10,641,197	*Lighting and traction station; gas power. Data to Mar. 31, 1910	176
otor car, trailers	..	..	..	..	..	..	..	Third rail pier electric railway. Energy purchased from Walton Elec. Supply Co.	177
d. ..	2,150*	1,301	800 A.H.	£102,146	£95,200*	436,654	5,071,154	*Lighting and traction station. Data to Mar. 31, 1909..	178
d. ..	*	..	..	£78,000	*	349,434	1,829,207	*Energy purchased from Wemyss Coal Co., Ltd. Data to Dec. 31, 1909	179
d. ..	1,550*	742 (tr. only)	150 KW.	£147,758	£65,315*	†	†	*Lighting and traction station. †See South Staffordshire Tramways. Data to March 31, 1910	180
d.d., 2 ter cars	11,400*	1,505	..	£516,500	..	2,908,000	37,850,000	*Lighting and traction station; energy supplied at 0.95d. per unit. Data to Mar. 31, 1910	181
d.d. ..	3,500	..	..	..	..	8,614,982*	59,255,919	6 converter sub-stns.; 4 fed from L.U.T. stn., 2 from Lot's Rd. *Also 137,770 horse tr. Data to Dec. 31, 1908	182
., 4 s.d.	1,100*	369	576 A.	£107,723 inclusive	*	136,024	1,030,760	*Lighting and traction station. Data to Dec., 1908 ..	183
., 54 s.d.	1,140*	..	750 A.H.	£515,826	*	1,404,629	11,867,950	*Lighting and traction station. Data for 1907-8 ..	184
d., 4 s.d. comb.	2,900* (tr. only)	1,300	750 A.H.	£246,866	*	1,030,720	9,670,657	*Lighting and traction station. Lorain surface-contact system. Data to Mar. 31, 1910	185
d. ..	*	..	..	£265,282	*	635,447	4,282,882	*Energy purchased from Dudley Corp. and Midland Elec. Corp. for Pr. Distribution. Data to Dec. 31, 1908	186
d. ..	*	..	..	£116,000	*	325,090	2,807,459	*Energy purchased from Worcester Corporation. Data for 1909	187
d. ..	*	..	..	£57,271	*	143,930	935,085	*Energy purchased from Wrexham Corporation. Data to Dec. 31, 1908	188
d. ..	400*	..	200 KW.-hours	..	*	687,086	4,557,788	*Lighting and traction station	189
d. ..	1,860	1,035	400 K.W	*	..	..	..	*In course of construction. Data to Mar. 31, 1910 ..	190
d., 16 s.d. egen.	†	about 1,600	..	..	†	1,250,000	8,887,827	*Dewsbury, Heckmondwike, Cleckheaton, Liversedge, Gomersal, Birstal, Birkenshaw, Batley, Thornhill, Ravensthorpe. †Energy purchased. Data to Dec.31,1909	191

	Name of Railway.	Districts Served.	Year of Opening.	Manager.	Electrical Engineer.	Consulting
1	BAKER ST. & WATERLOO RAILWAY	London: Elephant & Castle and Waterloo to Baker Street and Great Central Railway and Edgware Road	1906	A. H. Stanley		
2	CENTRAL LONDON RAILWAY	London: Shepherd's Bush to Bank. Extension to Liverpool St. under construction	1900	G. C. Cuningham (Gen. Man.)	E. P. Grove (Mech. and Elec. Eng.)	Basil Mott, H.
3	CHARING CROSS, EUSTON AND HAMPSTEAD RAILWAY	London: Charing Cross to Hampstead and Golder's Green; branch line from Camden Town to Highgate	1907	A. H. Stanley		
4	CITY & SOUTH LONDON ELECTRIC RAILWAY	London: Euston & King's Cross to City and Clapham Common	1890	T. C. Jenkin	P. V. McMahon	Basil Mott &
5	GREAT NORTHERN & CITY ELECTRIC RAILWAY	London: Finsbury Park to City	1904	R. P. Brousson	R. P. Brousson	Sir Douglas Partners
6	GREAT NORTHERN, PICCADILLY & BROMPTON RAILWAY	London: Finsbury Park to Hammersmith	1906	A. H. Stanley		
7	HAMMERSMITH & CITY RAILWAY	London: Hammersmith & Addison Rd. to City	1906	J. C. Inglis	Roger T. Smith (G.W.R.)	Kennedy & J
8	LANCASHIRE & YORKSHIRE RAILWAY	Liverpool, Southport & Crossens; Liverpool Aintree, & Maghull	1904 (converted)	John A. F. Aspinall (Gen. Man.)	Geo. Hughes (Chief. Mech. Eng.)	
9	LIVERPOOL OVERHEAD RAILWAY	Liverpool Docks	1893	E. J. Neachell	E. J. Neachell	
10	LONDON, BRIGHTON & SOUTH COAST RAILWAY	London: Victoria to London Bridge *via* Brixton	1909 (Dec.) (converted)	William Forbes (Gen. Man.)	R. H. Houghton	Philip Daws
11	MERSEY TUNNEL ELECTRIC RAILWAY	Birkenhead & Liverpool	1903 (converted)	J. Shaw (Gen. Man.)	J. Shaw (Resident)	
12	METROPOLITAN DISTRICT RAILWAY	London: Wimbledon, Hounslow, Ealing, South Harrow, Uxbridge & Richmond to Charing Cross, City, East Ham, Barking, etc.	1905 (converted)	A. H. Stanley		
13	METROPOLITAN RAILWAY	London: Baker Street to Uxbridge, & Inner Circle	1905 (converted)	B. H. Selbie (Gen. Man.)	Charles Jones	
14	MIDLAND RAILWAY	Lancaster, Morecambe and Heysham Harbour	1908 (converted)	W. G. Granet (Gen. Man.)	W. B. Worthington (Chief Engineer) Henry Fowler (Loco.)	
15	NORTH-EASTERN RAILWAY	Newcastle & Tyneside	1904 (converted)	A. Kaye Butterworth (Gen. Man.)	W. Worsdell (R. S.), C. A. Harrison (P.W.)	Merz and Mc
16	WATERLOO & CITY ELECTRIC RAILWAY	London: Waterloo Station & City (Mansion House)	1898	Sir C. J. Owens (Gen. Man.)	Herbert Jones	

ELEC

	Name of Power Company.	Districts Served.	Generating Stations.	Year of Opening.
1	CLEVELAND & DURHAM COUNTY ELECTRIC POWER CO.	North Riding of Yorkshire and part of Durham County (820 sq. miles)	Grangetown*	1904
2	CLYDE VALLEY ELECTRIC POWER CO.	Parts of Lanark, Renfrew, Dumbarton and Stirling (750 sq. miles)	Yoker and Motherwell	1905
3	CORNWALL ELECTRIC POWER CO.	County of Cornwall	Hayle. (St. Blazey and Phillack, proposed)	
4	COUNTY OF DURHAM ELECTRIC POWER SUPPLY CO.	County of Durham (250 sq. miles)	Supplied in bulk by Newcastle-upon-Tyne Electric Supply Co.	1902
5	DERBYSHIRE & NOTTINGHAMSHIRE ELECTRIC POWER CO.	County of Nottingham and part of the County of Derby (1,570 sq. miles).	Ilkeston (Newark and Sutton-in-Ashfield, proposed)	1903
6	DURHAM COLLIERIES ELECTRIC POWER SUPPLY CO.	Durham Colliery District*	Philadelphia	1906
7	FIFE ELECTRIC POWER CO.	County of Fife	Townhill	1905
8	GLOUCESTERSHIRE ELECTRIC POWER CO.	County of Gloucester	Stroud and West Dean	
9	KENT ELECTRIC POWER CO.	County of Kent, except Isle of Thanet & area of West Kent Electric Co., Ltd.	Frindsbury	1907
10	LANCASHIRE ELECTRIC POWER CO.	Lancashire south of the Ribble, excluding Manchester, Salford, Stockport, part of Bolton, Liverpool and Bootle	Radcliffe	1905
11	LEICESTERSHIRE & WARWICKSHIRE ELECTRIC POWER CO.	Counties of Leicester and Warwick (1,340 sq. miles)	(Newbold-on-Avon, Whitacre, Hinkley, Glenfield and Measham, proposed)	
12	METROPOLITAN ELECTRIC SUPPLY CO., LTD.	City of Westminster (part) Paddington, Acton (bulk) Hanwell, Southall, and Greenford (detached)	Willesden Works.	1888
13	MIDLAND ELECTRIC CORPORATION FOR POWER DISTRIBUTION, LTD.	Amblecote, Brettell Lane, Brierley Hill, Bilston, Bradley, Compton, Cradley Heath, Darlaston, Deepfields, Finchfield, Heath Town, Kingswinford, Lye, Lower Gornal, Old Hill, Ocker Hill, Penn, Princes End, Pensnett, Quarry Bank, Short Heath, Tipton, Tettenhall, Willenhall, Wednesfield, Wordsley, Wednesbury.	Ocker Hill, Tipton	1902
14	NEWCASTLE-UPON-TYNE ELECTRIC SUPPLY CO., LTD.	Part of Northumberland (375 sq. miles)	Carville and Neptune Bank	1890
15	NORTH METROPOLITAN ELECTRIC POWER SUPPLY CO.	Counties of Middlesex, Hertford & Essex (826 sq. miles); also London (Stoke Newington)	Brimsdown	1904
			Willesden	1903
			Hertford	1901
			St. Albans	1908
16	NORTH WALES POWER & TRACTION CO., LTD.	Supplies slate quarries in the neighbourhood of Carnarvon, Blaenau Festiniog, &c.	Cwm-Dyli. Snowdon. (Water power)	1906
17	NORTH-WESTERN ELECTRICITY & POWER GAS CO.	Parts of Stafford, Derby, Flint and Denbigh	(Stone, Sutton and Ruabon, proposed)	
18	PRIESTMAN POWER CO., LTD.	Energy sold in bulk to Newcastle Electric Supply Co.	Blaydon	1904
19	SCOTTISH CENTRAL ELECTRIC POWER CO.	Linlithgow, Clackmannan, parts of Stirling and Dumbarton (400 sq. miles)	Bonnybridge	1905
20	SOUTH WALES ELECTRICAL POWER DISTRIBUTION CO.	Glamorganshire and part of Monmouth (1,034 sq. miles)	Treforest (and Cwmbran*)	1904
21	YORKSHIRE ELECTRIC POWER CO.	Yorkshire (West Riding) 1,800 sq. miles	Thornhill	1905

Printed by WILLIAM CATE, LTD., Hogarth House, Bouverie Street, E.C., and published by the proprietors, H. ALABASTER, GATEHOUSE &

ELECTRIC RAILWAYS.

Engineer.	Consulting Engineers.	Length of Route in Miles.	Average distance between Stations, miles.	Average Schedule Speed, miles per hour.	Weight of Rails per Yard. Running.	Weight of Rails per Yard. Conductor.	No. of Motor Cars.	No. of Trailers.	Power Station Capacity, Kilowatts.	Maximum Load Recorded, Kilowatts.	Maximum Output of Battery.	System of Generation.	Line Equipment.	Line Pressure.	
.. ..	.. ..	4.69	0.47	15.2	90 lb.	85 lb.	36	72	44,000	..	..	11,000 v. 33⅓~, 3-ph.	3rd and 4th rails	600 volts D.C.	£
e (Mech. and g.)	Basil Mott, H. F. Parshall	6.3 7.36 authorised	0.5	15.5	100 lb.	85 lb.	64	172	7,600	..	..	5,000 v. 25~, 3-ph.	3rd rail	550 volts D.C.	..
.. ..	.. ..	8.058	0.54	16.70	90 lb.	85 lb.	60	90	44,000	..	..	11,000 v. 33⅓~, 3-ph.	3rd and 4th rails	600 volts D.C.	£
ahon ..	Basil Mott & David Hay	7.33	0.523	14.3	60 lb. & 80 lb	40 lb.	52 locos.	165 coaches	3,850	1,700	..	500, 1,000 & 2,000 v. D.C. ..	3rd rail	500 volts D.C.	£
sson ..	Sir Douglas Fox & Partners	3.42	0.684	15.7	85 lb.	80 lb.	32	44	3,440	2,120	..	550 v. D.C.	3rd & 4th rails..	550 v. D.C. ..	£
.. ..	.. ..	9.495	0.45	17.78	90 lb.	85 lb.	72	146	44,000	..	..	11,000 v. 33⅓~, 3-ph.	3rd and 4th rails	600 volts D.C.	£
mith (G.W.R.)	Kennedy & Jenkin ..	4.71	..	..	97½ lb.	102 lb.	..	..	4,000	3,500	1,500 KW.	6,500 v., 50~, 3-ph.	3rd & 4th rails..	600 volts D.C.	.
es (Mech. Eng.)	.. ..	37	1.135	30	86 lb.	70 lb.	504-motor, 12 2-motor	52	9,750	6,000 for 1 hour	5 bats. 6,200 A.H. total 650 KW.	7,500 v., 25~, 3-ph.	3rd rail & insulated return* ..	600 v. D.C. ..	..
hell	.. ..	6.5	0.4	..	60 lb.	..	44	7	2,300	..	650 KW.	500—550 v. D.C.	3rd rail	500 volts D.C.	..
ghton ..	Philip Dawson.. ..	9	0.81	23.5	94 lb.	Overhead	16	11	*	..	..	6,700 v., 1-ph.	Overhead conductor, rail return	6,600 volts A.C.	..
esident) ..	.. ..	4.77	0.74	..	86 lb.	100 lb. 60 lb.	24	37	4,000	3,500	650 KW.	650 v. D.C.	3rd and 4th rails	600 volts D.C.	£
.. ..	.. ..	24.3*	0.65	17.05	86 lb.	100 lb.	161	198	44,000†	†	†	11,000 v., 33⅓~, 3-ph. ..	3rd & 4th rails..	600 volts D.C.	£1
ues	.. ..	26	0.71	22	86 lb.	100 lb.	110, and 20 locos.	210	20,500	12,000	..	11,000 v. 33⅓~, 3-ph.	3rd and 4th rails	600 volts D.C.	£1
thington f Engineer)	.. ..	10	3.75	30 and 21.5*	85 lb.	Overhead	3	6	685	1,012	350 KW. for 1 hour	Gas driven D.C. gen. and D.C. A.C. motor gen. 6,600 v. 25~, 1-ph.	Overhead conductor, rail return	6,600 volts, 1-ph. A.C.	.
ler (Loco.) ll (R. S.), rison (P.W.)	Merz and McLellan ..	29.5*	1.25	22	90 lb.	80 lb.	62	44	†	..	..	6,000 v., 40~, 3-ph.	3rd rail	600 v. D.C. ..	.
nes	.. ..	1.5	1.5	18	87 lb.	46 lb.	17	12	1,200	600	..	510– 530 v. D.C.	3rd rail	500 volts D.C.	£

LECTRIC POWER COMPA

	Year of Opening.	Engineer and Manager.	Consulting Engineers.	Power Station capacity, Kilowatts.	Maximum load recorded, Kilowatts.	System of Generation.	System of Distribution.	Total Connect of all kind
.. .. ..	1904	A. B. Gridley (Man.) ..	Charles H. Merz and William McLellan	6,000	8,700	11,500 v., 40~, 3-ph.	Three-phase—Underground and Overhead	25,500 K.W
. .. ..	1905	David A. Starr	Strain & Robertson ..	13,600	7,000	11,000 v., 25~, 3-ph.	400 v. 3-ph., 230 v. single ph.	22,000 KW
proposed) ..	..	L. A. Hards	Edmundson's Electricity Corporation, Ltd.	1,500 K.W.	.. .. ..	3-phase, 10,000 volts	.. ..	.. ..
- upon - Tyne	1902	A. S. Esslemont (Man.) ..	Charles H. Merz and William McLellan.	.. .. ..	.. .. ..	5,750 v., 40~, 3-ph.	Transmission 20,000 volts and 5,500 volts, Cables and Overhead Lines. Distribution 480 & 240 volts D.C., 500 & 600 volts for traction; 440 volts 3-ph.	27,600 KW
- in - Ashfield,	1903	A. E. Loos (Gen. Man.) ..	.. ..	1,500	667	11,000 v., 25~, 3-ph. and 500-550 v. D.C.	2,200 v., & 440 v., 3-ph.	2,550 KW
. .. ..	1906	†See "Remarks ..	†See "Remarks" ..	11,000	4,927	5,750 v., 40~, 3-ph.	3-core Underground Cables and Overhead Lines ..	9,250 KW
. .. ..	1905	J. S. Thomson (Gen. Man.)	.. ..	2,100	.. .. ..	3,000 v., 50~, 2-phase. 6,000 v., 50~, 3-phase.. ..	3,000 v. 2-ph. and 6,000 v. 3-ph. underground and overhead. 440 & 220 v., 2 & 3-ph., underground	.. ..
. .. ..	..	.. ..	G. L. Addenbrooke ..	.. ..	.. .. ..	.. ..	.. ..	.. ..
. .. ..	1907	B. H. Harvey (Man. and Engineer)	.. ..	3,500	850	11,000 v., 50~, 3-ph.	400 & 230 v., 3-ph. 100 & 230 v., single ph.	2,100 KW.
. .. ..	1905	C. D. Taite	H. F. Parshall	8,000	3,950	10,000 volts, 50~, 3-ph.	Various	10,000 H.P
inkley, Glen-	..	.. ..	.. ..	.. .. ..	.. .. ..	.. ..	.. ..	.. ..
. .. ..	1888	J. S. Highfield	.. ..	18,500	7,670 (on Feeders)	10,000 v., 60~, A.C.	A.C. at 60~, D.C. at 100 & 200 v.	25,431 KW
. .. ..	1902	J. Hardie McLean ..	J. Hardie McLean ..	6,200	4,630	7,000 v., 50~, 2-ph.	200 v. per phase	8,106 KW.
. .. ..	1890	R. P. Sloan (Man.), J. S. Watson (Tech. Man.)	Charles H. Merz and William McLellan	47,000*	42,000	5,750 v., 40~, 3-ph.	Transmission 20,000 volts and 5,500 volts. Three-phase, 440 volts; D.C., traction 500 and 600 volts, lighting, etc., 480 and 240 volts	97,000 KW
. .. ..	1904	H. H. Perry (Res.) ..	A. H. Pott..	5,000	3,015	50~, 3-ph., at 10,000 v.	In bulk, D.C. three-wire, and 3-ph.	10,200 KW
. .. ..	1903	F. D. Napier (Res.) ..	E. Ruthven-Murray (Engineer-in-Chief)	5,850	3,200	50~, 3-ph., at 10,000 and 2,950 v.; and direct current at 240, 480 and 550 v.	Also under Tottenham and Edmonton E.L. Orders 3-ph. 4-wire	
. .. ..	1901	J. M. Bowman (Res.) ..	Do.	300	175	230 and 460 v. D.C.	Direct	375 KW.
. .. ..	1908	T. E. Eachus (Res.) ..	Do.	490	230	230 and 460 v. D.C.	Direct	130 KW.
ver)	1906	G. K. Paton (Elec. Eng.)	.. ..	4,000	.. .. ..	10,000 volts, 50~, 3-ph.	Overhead transmission lines 10,000 and 20,000 volts, 3-phase	3,050 B.H.P
ed)	..	.. ..	Lacey, Sillar & Leigh; H. A. Humphrey	.. .. ..	.. .. ..	.. ..	.. ..	.. ..
.. ..	1904	.. ..	Merz & McLellan ..	2,800	2,600	5,750 v., 40~, 3-phase	Sold in bulk, H.T.	.. ..
.. ..	1905	E. C. Churchward (Gen. Man. and Engineer).	Bramwell & Harris ..	2,700	800	3,000 v., 50~, 2 & 3-ph.	3,000 v., 50~, transformed to 440 v., 50~, 2 and 3-ph., at consumer's premises	.. ..
.. ..	1904	W. A. Chamen	.. ..	T. 7,500 C. 1,900	4,018	11,000 v., 25~, 3-ph.	2,200, 440 & 230 v., 25~, 3 & 1 ph.	9,958 H.P
.. ..	1905	W. B. Woodhouse ..	.. ..	10,000	.. .. ..	10,000 v., 50~, 3-ph.	2,000 and 400 v., 3-ph.; 230 v. 1-ph.; 500 v. D.C. ..	12,009 KW

ELECTRIC RAILWAYS.

ectrical Engineer.	Consulting Engineers.	Length of Route in Miles.	Average distance between Stations, miles.	Average Schedule Speed, miles per hour.	Weight of Rails per Yard. Running.	Weight of Rails per Yard. Conductor.	No. of Motor Cars.	No. of Trailers.	Power Station Capacity, Kilowatts.	Maximum Load Recorded, Kilowatts.	Maximum Output of Battery.	System of Generation.	Line Equipment.	Line Pressure.	Capital C
.. .. ..	.. ..	4.69	0.47	15.2	90 lb.	85 lb.	36	72	44,000	..	..	11,000 v. 33⅓~, 3-ph... ..	3rd and 4th rails	600 volts D.C.	£3,194,600
. Grove (Mech. and lec. Eng.)	Basil Mott, H. F. Parshall	6.3 7.36 authorised	0.5	15.5	100 lb.	85 lb.	64	172	7,600	..	..	5,000 v. 25~, 3-ph.	3rd rail	550 volts D.C.	.. ..
.. .. ..	.. ..	8.058	0.54	16.70	90 lb.	85 lb.	60	90	44,000	..	..	11,000 v. 33⅓~, 3-ph... ..	3rd and 4th rails	600 volts D.C.	£5,767,976
. McMahon ..	Basil Mott & David Hay	7.33	0.523	14.3	60 lb. & 80 lb	40 lb.	52 locos.	165 coaches	3,850	1,700	..	500, 1,000 & 2,000 v. D.C. ..	3rd rail	500 volts D.C.	£3,145,553
. Brousson ..	Sir Douglas Fox & Partners	3.42	0.684	15.7	85 lb.	80 lb.	32	44	3,440	2,120	..	550 v. D.C.	3rd & 4th rails..	550 v. D.C. .. .	£2,010,000 a
. .. .	.. ..	9.495	0.45	17.78	90 lb.	85 lb.	72	146	44,000	..	..	11,000 v. 33⅓~, 3-ph.	3rd and 4th rails	600 volts D.C.	£6,960,931
er T. Smith (G.W.R.)	Kennedy & Jenkin ..	4.71	..	..	97½ lb.	102 lb.	..	..	4,000	3,500	1,500 KW.	6,500 v., 50~, 3-ph.	3rd & 4th rails..	600 volts D.C.	.. ..
. Hughes (Chief. Mech. Eng.)	.. ..	37	1.135	30	86 lb.	70 lb.	50 4-motor, 12 2-motor	52	9,750	6,000 for 1 hour	5 bats. 6,200 A.H. total 650 KW.	7,500 v., 25~, 3-ph.	3rd rail & insulated return*..	600 v. D.C...	.. ..
. Neachell	.. ..	6.5	0.4	..	60 lb.	..	44	7	2,300	..	650 KW.	500—550 v. D.C.	3rd rail	500 volts D.C.	.. ..
L. Houghton ..	Philip Dawson.. ..	9	0.81	23.5	94 lb.	Overhead	16	11	*	..	..	6,700 v., 1-ph.	Overhead conductor, rail return	6,600 volts A.C.	.. ..
haw (Resident) ..	.. ..	4.77	0.74	..	86 lb.	100 lb. 60 lb.	24	37	4,000	3,500	650 KW.	650 v. D.C.	3rd and 4th rails	600 volts D.C.	£3,598,135 (
.. .. ..	.. ..	24.3*	0.65	17.05	86 lb.	100 lb.	161	198	44,000†	†	†	11,000 v., 33⅓~, 3-ph. ..	3rd & 4th rails..	600 volts D.C.	£12,320,983
rles Jones	.. ..	26	0.71	22	86 lb.	100 lb.	110, and 20 locos.	210	20,500	12,000	..	11,000 v. 33⅓~, 3-ph... ..	3rd and 4th rails	600 volts D.C.	£15,108,025
B. Worthington (Chief Engineer) ry Fowler (Loco.) Worsdell (R. S.), A. Harrison (P.W.)	.. ..	10	3.75	30 and 21.5*	85 lb.	Overhead	3	6	685	1,012	350 KW. for 1 hour	Gas driven D.C. gen. and D.C. A.C. motor gen. 6,600 v. 25~, 1-ph.	Overhead conductor, rail return	6,600 volts, 1-ph. A.C.	.. ..
	Merz and McLellan ..	29.5*	1.25	22	90 lb.	80 lb.	62	44	†	..	..	6,000 v., 40~, 3-ph.	3rd rail	600 v. D.C. ..	.. ..
bert Jones	.. ..	1.5	1.5	18	87 lb.	46 lb.	17	12	1,200	600	..	510–530 v. D.C.	3rd rail	500 volts D.C.	£600,000*

ELECTRIC POWER COMPANI

Stations.	Year of Opening.	Engineer and Manager.	Consulting Engineers.	Power Station capacity, Kilowatts.	Maximum load recorded, Kilowatts.	System of Generation.	System of Distribution.	Total Connections of all kinds.	Ca Exp
.. ..	1904	A. B. Gridley (Man.) ..	Charles H. Merz and William McLellan	6,000	8,700	11,500 v., 40~, 3-ph.	Three-phase—Underground and Overhead	25,500 K.W.	£1,00 auth
.. ..	1905	David A. Starr	Strain & Robertson ..	13,600	7,000	11,000 v., 25~, 3-ph.	400 v. 3-ph., 230 v. single ph.	22,000 KW.	£62
hillack, proposed) ..	..	L. A. Hards	Edmundson's Electricity Corporation, Ltd.	1,500 K.W.	.. .. ..	3-phase, 10,000 volts	.. ..	.. .. ..	£45 auth
wcastle - upon - Tyne	1902	A. S. Esslemont (Man.) ..	Charles H. Merz and William McLellan.	.. .. ..	.. .. ..	5,750 v., 40~, 3-ph.	Transmission 20,000 volts and 5,500 volts, Cables and Overhead Lines. Distribution 480 & 240 volts D.C., 500 & 600 volts for traction; 440 volts 3-ph.	27,600 KW.	£21
Sutton - in - Ashfield,	1903	A. E. Loos (Gen. Man.)..	.. ..	1,500	667	11,000 v., 25~, 3-ph. and 500-550 v. D.C.	2,200 v., & 440 v., 3-ph.	2,550 KW.	
.. ..	1906	†See "Remarks ..	†See "Remarks" ..	11,000	4,927	5,750 v., 40~, 3-ph.	3-core Underground Cables and Overhead Lines ..	9,250 KW.	£15 auth
.. ..	1905	J. S. Thomson (Gen. Man.)	.. ..	2,100	.. .. ..	3,000 v., 50~, 2-phase. 6,000 v., 50~, 3-phase.. ..	3,000 v. 2-ph. and 6,000 v. 3-ph. underground and overhead. 440 & 220 v., 2 & 3-ph., underground	.. .. ..	£60 auth
.. ..	..	.. ..	G. L. Addenbrooke ..	.. .. ..	.. .. ..	.. ..	.. ..	.. .. ..	£25 auth
.. ..	1907	B. H. Harvey (Man. and Engineer)	.. ..	3,500	850	11,000 v., 50~, 3-ph.	400 & 230 v., 3-ph. 100 & 230 v., single ph.	2,109 KW.	£75 auth
.. ..	1905	C. D. Taite	H. F. Parshall	8,000	3,950	10,000 volts, 50~, 3-ph.	Various	10,000 H.P.	£35
cre, Hinkley, Glen-posed)	..	.. ..	.. ..	.. .. ..	.. .. ..	.. ..	.. ..	.. .. ..	£75 auth
.. ..	1888	J. S. Highfield	.. ..	18,500	7,670 (on Feeders)	10,000 v., 60~, A.C.	A.C. at 60~, D.C. at 100 & 200 v.	25,491 KW.	£1,8
.. ..	1902	J. Hardie McLean ..	J. Hardie McLean ..	6,200	4,680	7,000 v., 50~, 2-ph.	200 v. per phase	8,106 KW.	£42
.. ..	1890	R. P. Sloan (Man.), J. S. Watson (Tech. Man.)	Charles H. Merz and William McLellan	47,000*	42,000	5,750 v., 40~, 3-ph.	Transmission 20,000 volts and 5,500 volts. Three-phase, 440 volts; D.C., traction 500 and 600 volts, lighting, etc., 480 and 240 volts	97,000 KW.	£1,9
.. ..	1904	H. H. Perry (Res.) ..	A. H. Pott..	5,000	3,015	50~, 3-ph., at 10,000 v.	In bulk, D.C. three-wire, and 3-ph.	10,200 KW.	
.. ..	1903	F. D. Napier (Res.) ..	E. Buthven-Murray (Engineer-in-Chief)	5,850	3,200	50~, 3-ph., at 10,000 and 2,950 v.; and direct current at 240, 480 and 550 v.	Also under Tottenham and Edmonton E.L. Orders 3-ph. 4-wire		
.. ..	1901	J. M. Bowman (Res.) ..	Do.	300	175	230 and 460 v. D.C.	Direct	375 KW.	£536,
.. ..	1908	T. E. Eachus (Res.) ..	Do.	490	230	230 and 460 v. D.C.	Direct	130 KW.	
Water power)	1906	G. K. Paton (Elec. Eng.)	.. ..	4,000	.. .. ..	10,000 volts, 50~, 3-ph.	Overhead transmission lines 10,000 and 20,000 volts, 3-phase	3,050 B.H.P.	
, proposed)	..	.. ..	Lacey, Sillar & Leigh; H. A. Humphrey	.. .. ..	.. .. ..	.. ..	.. ..	.. .. ..	£1,50 autho
.. ..	1904	.. ..	Merz & McLellan ..	2,800	2,600	5,750 v., 40~, 3-phase	Sold in bulk, H.T.	.. .. ..	
.. ..	1905	E. C. Churchward (Gen. Man. and Engineer).	Bramwell & Harris ..	2,700	800	3,000 v., 50~, 2 & 3-ph.	3,000 v., 50~, transformed to 440 v., 50~, 2 and 3-ph., at consumer's premises	.. .. ..	£600 autho
.. ..	1904	W. A. Chamen	.. ..	T. 7,500 C. 1,900	4,018	11,000 v., 25~, 3-ph.	2,200, 440 & 230 v., 25~, 3 & 1 ph.	9,958 H.P.	..
.. ..	1905	W. B. Woodhouse ..	.. ..	10,000	.. .. ..	10,000 v., 50~, 3-ph.	2,000 and 400 v., 3-ph.; 230 v. 1-ph.; 500 v. D.C. ..	12,009 KW.	£329

Line Pressure.	Capital Outlaid.	Annual Train Mileage.	Passengers carried per Annum.	Ratio of Expenses to Receipts.	REMARKS.	
600 volts D.C.	£3,194,600	1,269,945	28,245,086	47.13%*	Controlled by the Underground Electric Railway Co. of London, Ltd., and energy supplied from that Co's. Chelsea power station. *Including rates and taxes.	1
550 volts D.C.	.. ..	1,705,048 (1909)	88,383,394 (1909)	49%	Separate tunnels. Four rotary-converter substations. Multiple-unit control, 7, 6 and 3-car trains, 2-minute service (for small portion of day 1¾ minute)	2
600 volts D.C.	£5,767,976	2,054,115	29,387,162	55.19%*	Controlled by the Underground Electric Railways Co. of London, Ltd., and energy supplied from that Co's. Chelsea power station. *Including rates and taxes	3
500 volts D.C.	£3,145,553	1,382,384	23,807,770	45.29%	First electric railway constructed. Separate tunnels. Energy transmitted to substations at 1,000 and 2,000 volts D.C.	4
550 V. D.C. ..	£2,010,000 authorised	681,077	12,410,000	53.14%	Separate tunnels. Two conductor rails, feeder. Multiple-unit control	5
600 volts D.C.	£6,980,931	2,453,351	37,494,725	46.25%*	Controlled by the Underground Electric Railways Co. of London, Ltd., and energy supplied from that Co's. Chelsea power station. *Including rates and taxes	6
600 volts D.C.	.. ..	.. ..	.. .. ..	..	Three motor-generator substations, two with batteries. Park Royal power station, built by G.W.R., also supplies power and light to stations and goods yards in the London district (2,000 KW. additional provided for this purpose).	7
600 V. D.C.. .	.. ..	1,476,000	.. .. ..	..	*Third rail outside track; fourth rail between running rails (no collector on it). Direct and multiple unit control. Four rotary-converter substations, and five batteries. Four-coach trains, 8 150-H.P. motors per train; also multiple-unit coaches, two 125-H.P. motors per coach.	8
500 volts D.C.	.. ..	848,951	7,825,157	70.78%	The Railway Co. constructed the Seaforth & Gt. Crosby tramways; power transmitted from railway power station to tramway substation at 1,100 V. D.C. Works cost per unit generated, 0.3905d.	9
6,600 volts A.C.	.. ..	.. ..	.. .. ..	..	Single-phase A.C. motors; direct supply from power station to overhead conductor at 6,600 volts. *Energy purchased from London Electric Supply Corporation	10
600 volts D.C.	£3,598,135 (inclusive)	722,468	14,396,000	63.45%	Tunnel railway under River Mersey, formerly worked by steam (opened 1886). Third rail outside, return rail between running rails ..	11
600 volts D.C.	£12,320,983	3,195,659	66,852,301	54.39	Converted from steam. Turbine power station, 11 rotary-converter substations. Multiple-unit control. *Also joint owners of 4 miles, running powers over 25½ miles, in addition. †Chelsea Power station, belongs to the Underground Electric Railways Co. of London.	12
600 volts D.C.	£15,108,025	3,715,984 partly steam	99,961,997	51.79%	Turbine power station. Third and fourth rails outside running rails. Multiple-unit control. Rotary-converter substations. Total mileage worked over, 78 miles (inc. 51½ G. C. Joint, not worked electrically).	13
6,600 volts, 1-ph. A.C.	.. ..	86,7t2	.. .. ..	..	Single-phase A.C. motors; no feeders or transformers. *Lancaster-Morecambe, 30 miles p. h.; Morecambe-Heysham, 21.5 miles p. h., exclusive of stops. Speed restricted to 10 miles p. h. at all three stations.	14
600 V. D.C. ..	.. ..	1,211,491; car-miles 3,774,668	.. .. ..	..	Rotary-converter substations. Multiple-unit control. 2 locos. for goods, and 3 motor wagons for parcels traffic. *Route miles of running lines electrified to present time. †Power supplied by Newcastle-on-Tyne Electric Supply Co. from Carville turbine power station.	15
500 volts D.C.	£600,000*	190,000*	5,500,000*	45%*	Separate tunnels. Third rail between track rails. Line owned by L. & S.-W. Ry. Co. *Approximate figures	16

ANIES.

	Total Connections of all kinds.	Capital Expended.	Price Charged per unit.	System of Charging.	Units Sold during last complete Year.	Remarks.	
.	25,500 K.W.	£1,000,000 authorised	Power 1½ to ¾d. with discounts ..	Max. demand and flat rate with discounts	.. .. ..	Bulk supply to Middlesbrough. Address: Hinton's Buildings, Middlesbrough. Sec., A. Gemmell. * Supply in bulk is also obtained from the stations of The Waste Heat and Gas Electrical Generating Stations, Ltd., at Newport, Weardale, Teesbridge and elsewhere	1
.	22,000 KW.	£629,470	3.5 to 0.75d.	Max. demand	.. .. ..	Yoker started August, 1905, and Motherwell January, 1906. Address: 53, Bothwell St., Glasgow. Sec., Robert Robertson	2
.	.. .. ..	£450,000 authorised	.. ..	.. ..	.. .. ..	Supply not commenced. Shares in Company now held by the Urban Electric Supply Co., whose generating station is situated at Carn Brea, and supplies the districts of Camborne and Redruth, and surrounding country	3
d	27,600 KW.	£217,341	Power 1½d. with discounts	.. ..	.. .. ..	Sec., N. H. Firmin, Royal Exchange Buildings, Newcastle-upon-Tyne. For technical details see Gateshead, Jarrow, etc. (Co. Durham Electrical Power Distribution Co., Ltd.)	4
.	2,550 KW.	..	1.375 to 0.4d.	Max. demand & sliding scale	1,183,691	Offices: 53, Temple Chambers, Temple Avenue, London. Sec., G. D. Prince	5
.	9,250 KW.	£155,000 authorised	.. ..	.. ..	.. .. ..	*Also supplies Sunderland and District Tramways Co. at 0.75d. per unit. Lambton & Hetton Collieries. †System operated by the Newcastle-upon-Tyne Electric Supply Company, Ltd. Sec., S. W. Hemmin, Basildon House, E.C.	6
-	.. .. ..	£600,000 authorised	.. ..	.. ..	.. .. ..	Statistics not yet available	7
.	.. .. ..	£250,000 authorised	.. ..	.. ..	.. .. ..	Supply not commenced. Sec., J. French, 5, Rowcroft, Stroud, Glos.	8
.	2,109 KW.	£750,000 authorised	Lighting 7d. and 2d., or 4½d. Power 1.66 to 0.52d. & by Contract	Sliding scale depending on load factor	1,452,186	Supply from Frindsbury Power Station commenced January 1, 1907. Sec., F. A. H. Walker, Frindsbury Power House, Strood, Kent.	9
	10,000 H.P.	£358,000	From .4 to 4d., depending on load factor	Various	7,057,659	Secretary and Offices, T. E. Kay, A.E.A.A., 196, Deansgate, Manchester..	10
	.. .. ..	£750,000 authorised	.. ..	.. ..	.. .. ..	Registered offices: 53, Temple Chambers, Temple Avenue, E.C.	11
	25,431 KW.	£1,898,422	Private lighting 5½d. to 5d. Trade 5d. to 3d. Power 3d. & ¾d.	Flat rate, scale, & max. dem.	11,900,970	.. ..	12
.	8,106 KW.	£428,495	Lighting 4d., with various discounts; pr. 3 & 0.825, or 1½d., with various discounts.	Max. demand & flat rate ..	7,114,748	Sec., G. Sales, 14, Dale Street, Liverpool	13
	97,000 KW.	£1,931,882	Lg. 3¾d.; pb. lg. £2 15s. 6d. per 16-C.P. p.a.; pr. 1½d. with discounts	Flat rate and max. demand ..	.. .. ..	Sec., M. Short, Royal Exchange Bldgs., Newcastle-upon-Tyne. *New station under construction at Dunston to contain Turbo Alternators of an initial capacity of 23,000 KW.	14
	10,200 KW. 375 KW. 180 KW.	£536,000	25/- to 20/- per KW. of max. dem. per quarter, & 1d. to 0.25d. per unit metered	Contract on max. demand & flat rate	16,402,447	Supply in bulk to Willesden U.D.C., Stoke Newington B.C., Hendon Electric Supply Co., Ltd., North Met. E.P. Distribution Co., Ltd., at Barnet, Enfield, Hertford, St. Albans, etc., and to Edmonton and Tottenham, under E.L. Orders. Also to Met. Elec. Tramways, the Middlesex and Hertfordshire County Light Railways, and to numerous Power Consumers.	15
	3,050 B.H.P.	..	Approx. av. 1d., sliding scale ..	Various	.. .. ..	Quarry supply at 500 volts, 50~, 3-phase. Sec., R. B. Humphreys, Old Bank Buildings, Chester	16
	.. .. ..	£1,500,000 authorised	.. ..	.. ..	.. .. ..	Acting Secretary, James Lomax, 87, Cross Street, Manchester. The Company has not yet commenced operations	17
	.. .. ..	..	.. ..	.. ..	.. .. ..	Boiler fired by waste heat and gas from the coke ovens of the Priestman Colliery Owners	18
	.. .. ..	£600,000 authorised	Power 1.25 to 0.75d.; traction, contract	Maximum demand, sliding scale, 2-rate meter and contract	1,500,000	Operations commenced end of 1905. Sec., Jas. Walker, 25, Frederick Street, Edinburgh. (Head Office) Commercial Bank Buildings, Kirk Wynd, Falkirk	19
	9,958 H.P.	..	4½d. to 0.35d.	Flat rate & sliding scale ..	9,833,032	Sec., G. P. Tutcher, Royal Chambers, Queen St., Cardiff. *Cwmbran Station shut down May, 1909; now kept as stand-by only. Cwmbran area supplied from Treforest Station	20
	12,009 KW.	£329,944	Terms on application	Max. demand	.. .. ..	Address: Thornhill, near Dewsbury. Sec., J. J. H. Stansfield	21

INCORPORATED MUNICIPAL ELECTRICAL ASSOCIATION: GLASGOW CONVENTION.

THIS year the Municipal Electrical Convention is being held in Glasgow, where the members and visitors received a cordial welcome at the hands of the Lord Provost (the Hon. A. M'Innes Shaw), on Tuesday morning last, in the Rankine Hall of the Institute of Engineers and Shipbuilders.

In a commendably brief speech the Lord Provost referred to the development of electrical supply work in Glasgow, in both the domestic and the industrial spheres, and added his opinion that it was an essential to present-day progress.

His Lordship expressed the conviction that Glasgow would ever be associated with the name of Lord Kelvin and his great work in the interests of civilisation.

Mr. James Willock, Convener of the electricity department, seconded the Lord Provost's welcome.

After thanking the Corporation for their greeting, the President for the year (Mr. W. W. Lackie), read his address, some extracts from which are given below; and subsequently papers by Mr. A. C. Cramb (chief electrical engineer, Croydon), on "Commercial Progress," and Mr. H. Collings Bishop (chief electrical engineer, Newport, Mon.), were read in abstract and jointly discussed.

At the conclusion of the morning's business the members and delegates were entertained at luncheon at the City Chambers by invitation of the Tramways and Electricity Committee, the Lord Provost presiding. After the loyal toasts, his Lordship submitted that of "The Incorporated Municipal Electrical Association," coupling with it the name of the president. Mr. W. W. Lackie, in reply, eulogised the work of the Association, whose members, he said, represented 82 per cent. of the cities and towns of Great Britain.

The afternoon was devoted to visits to the Corporation power stations at Pinkston and Port Dundas, the latter station containing at the present time, in addition to other plant, four 4,000-H.P. and one 5,000-H.P. three-phase turbo-alternators generating at 6,500 volts, 25 cycles, and making in all some 30,000 H.P. It may be mentioned that the St. Andrew's Cross station of the electricity department also contains some 13,000 H.P. of turbine plant; this station was included in Thursday's visits. On Tuesday evening a reception was held at the City Chambers by the Lord Provost.

On Wednesday the members visited Edinburgh, when two turbine papers, by Mr. F. Newington (chief electrical engineer, Edinburgh) and Mr. Ashton Bremner (chief electrical engineer, Burslem) were read and discussed.

In this city also the members were entertained to luncheon by the civic authorities, and subsequently visited the local electricity works.

Thursday's business consisted of impromptu discussions initiated by Mr. George Wilkinson (chief electrical engineer, Harrogate), and Mr. S. E. Fedden (chief electrical engineer, Sheffield), on subjects which have already been announced; visits to various local works followed, and in the evening the annual dinner was held. To-day the annual general meeting is to take place.

Presidential Address.

By W. W. LACKIE, *Chief Electrical Engineer, Glasgow.*

THIS was their fifteenth annual Convention, and the number of honorary members, members, associate members, and associates was as follows:—Honorary members, 3; members (committees), 170; members (engineers), 191; associate members, 11; associates, 41; total, 416.

The Association met in Glasgow in 1901 under the chairmanship of Mr. Chamen; the progress made in the supply of electrical energy during the nine years which had intervened was shown by the following figures:—In Glasgow in 1901 electrical energy cost, including interest, depreciation and sinking fund, 2·96d. per unit, as against 1·73d. to-day. Excluding the standing charges, the works costs then were 1·41d. per unit, as against ·532d. per unit to-day. The larger electrical undertakings throughout the kingdom showed similar evidence of development.

Very important work had been done by the Council during the past year. Last August the Electric Lighting Acts (Amendment) Bill received the Council's careful consideration, and the amendments embodied in the Act were practically all in accordance with the expressions of opinions received from the representatives of the municipalities interested. To the Scottish Municipalities it was particularly gratifying that an amendment was accepted at the last moment, protecting authorised undertakings from unfair and unreasonable competition on the part of unauthorised companies.

The Clause regarding the raising of capital by municipalities for the purpose of wiring consumers' premises, and the hiring-out of motors, &c., was dropped out entirely. If the Clause authorising the work in consumers' premises to be done "through a contractor only," had been passed it would have been contrary to the existing Electric Lighting Acts and Orders, and undoubtedly would have been found quite unworkable.

In those places where municipalities had taken up the supply of water, gas and electricity, Government had made laws and regulations to protect the capital of the ratepayers from being speculated with. Private companies supplying electricity might do many things that a municipality might not do. Without asking for Parliamentary powers, a private company might let on hire motors and other apparatus, fit up complete installations, and undertake the wiring of lamps and the erection of motors, and their maintenance on consumers' premises. They might buy land and feu it for factories, or for such purposes as would tend to create a demand for electrical energy. Before a municipality could do any of these things they must get Parliamentary sanction, and such sanction, in many cases, would be refused—in some cases rightly so.

It had been alleged that the electrical industry had suffered through municipalities obtaining powers for raising money for electrical purposes. This, he was certain, was a fallacy. Municipalities had done much to advance the industry. In many burghs they undertook the supply of electrical energy at a time when no company would have ventured to do so. Further, they borrowed money at a low rate of interest, the benefit of which was directly reaped by the public in a cheapened supply of energy; and nothing was or could be better for the whole industry than such a supply. It led to more than an equivalent amount of plant being installed in consumers' premises, and the supply of such plant was, as a rule, left to private enterprise—in any case, the manufacturer at least made all the plant both for the supply authority and for the consumer, and orders were likly to be more numerous where the rates for the supply of energy were low. Some kind of protection should be extended to those municipalities who, after acting as pioneers, now found their areas surrounded or invaded by private supply companies. These power companies could, as a rule, select their consumers; naturally, they chose those that were more profitable, and left the less profitable to be supplied by the municipality. This led to unfair comparison in the same district between the rates of charge made by the municipality and those made by the private company. The municipal concern, which must supply every kind of demand that was made, and was excluded from certain forms of exploitation permitted to the private company, should be protected from the possibility of the private concern invading the municipal area, and securing the large power user by offering a specially low rate which, while it did not pay the company, might be an indirect means of profit. In like manner he was also adverse to a municipal concern harassing a company in this way. If, and so long as, the municipal authority was giving a supply at a rate which just covered the statutory requirements in the form of interest and sinking fund, it should not be subjected to anything like a tariff war with an outside company.

The question of depreciation and its relation to sinking fund still remained undecided. Since the rate of sinking fund had been so seriously increased, any undertaking having a rate of not less than 3¾ per cent. and a reserve fund equal to one-tenth of its capital, was surely quite sound financially. He considered that:—

1. Depreciation of value was met by the sums set aside for sinking fund if such sinking fund were properly calculated upon the probable life of the plant.

2. Decreased efficiency should be met by depreciation if the ordinary maintenance chargeable to revenue was not sufficient to keep the plant in its first state of efficiency.

3. Obsolescence did not mean or involve depreciation, but a prudent authority might look to the advantage which would be gained by installing present-day plant, and so getting greater efficiency. Such an authority would annually lay aside a sum for this purpose, and might be found dispensing with old plant in favour of something more up to date, even although the former might not have reached the end of its usefulness. Such a course, however, was not compulsory, and it was not legal to create a deficit by setting aside a sum either in name of depreciation or of reserve fund. Only such sums as were profits were available for this purpose. The deduction for wear and tear to be made was for diminished value as a means of *earning income*, and not as a saleable subject.

During the past year suppliers of electrical energy had been seriously affected by the general depression in trade throughout the country, and this depression was undoubtedly emphasised by the introduction of the metal-filament lamp.

The metal-filament lamp would do for the supply of electricity for lighting purposes what the incandescent mantle had done for gas lighting, and more also; but the immediate effect had been to cause many stations to cease putting down additional plant for a year at least. One was glad to think that no such radical change in the efficiency of motors could take place.

Much could be said in favour of the supply authority providing the consumers with lamps. Frequently bad lighting was found to be entirely due to defective lamps. It seemed to him that in the end it would be for the best welfare, not only of the supply undertaking, but of the wiring contractors, if the lamps were left to the supply authority, either to be supplied and the price included in the charge per unit, or sold direct to the consumer by the supply authority.

Very great improvements in heating and cooking appliances had been effected, and more extensive use of electricity was daily being made for these purposes.

The chief effect of the temporary lull in output had been that municipal engineers had had time to put their works into better order, and to re-examine their methods of organisation to see if any untapped economies could be effected.

The growth of the electrical undertaking of the City, since it received its order in 1890, had been very remarkable. The growth of the demand for power, in many cases for very large manufacturing concerns, had emphasised the need for the municipal supply to be steady and continuous throughout the whole 24 hours of the day, and had to that extent added to the responsibilities of the municipality and of the municipal engineer. With a large power load all the year round, the few leisure moments still left in the summer months were more than fully occupied in preparing for winter.

Rapid growth of supply had brought to the front the question of rates of charge to special classes of consumers. A flat rate per unit was wanted by most people, and it appeared to him that it might be possible to adopt this. Any flat rate adopted must be based on the load factor of each consumer, and, where classification was possible, on the average load factor of any one class. Such a method might lead to increased consumption of energy.

The cost of electrical energy did not depend upon the number of units used, but upon the maximum rate at which the energy was demanded—the capital expenditure involved to supply the units demanded. The rate per unit was not a reliable criterion as to whether the supply was cheap or dear. The time might be approaching when, instead of charging a rate per unit, they would charge so much per 10 units; this would enable them to make fractional reductions smaller than the minimum possible reduction of ¼d. per unit with the present method of charge. For instance, their rates in Glasgow varied from 3½d. to ¾d.; this would work out at 2s 11d. per 10 units for light, and 7½d per 10 units for power. It had been suggested that the municipal electricity supply undertaking should, in certain circumstances, give power supplies to large industrial concerns even at a loss, for the sake of the secondary profit that might accrue through the employment thus provided. He thought this was not sound reasoning. The first duty of the supply undertaking was to see that all classes of consumers paid their due share of the standing charges on the capital expenditure necessary to provide plant to supply them. If the undertaking were to sell energy at a loss for the sake of the problematical inducement held out to a manufacturer to extend his premises, the whole question of tariffs would, ere long, be in a state of hopeless confusion. It would be to their common advantage if those who had a number of large lighting or power users connected to their mains came to some agreement as to the basis upon which the rates of charge to such consumers should be founded. The present lack of uniformity in methods of charging was a fruitful source of trouble.

Commercial Advancement of Electric Supply.

From the official programme issued by the Incorporated Municipal Electrical Association we reasonably anticipated that valuable information would be forthcoming relating to the subject of this paper, but regret that still another opportunity has passed without any indication of improvement in the commercial methods of municipal supply authorities, as far as can be deduced from the material for discussion laid before the members at Glasgow by Mr. A. C. Cramb.

The object of the paper was, in the author's words: (1) To urge the necessity of a vigorous development campaign; (2) to indicate on general lines how this should be done.

The necessity for a vigorous campaign is attributed to the malign influence of the metallic lamp. Prior to the advent of this potent factor in the awakening to commercial activity of electricity supply authorities "comparatively little attention was bestowed upon commercial development," particularly in the case of those municipally controlled.

We are not of the few who are seriously inclined to disagree with the author upon this point, but we certainly do disagree with the statement that "electric supply is as much a competitive business as any other," and as this appears to be the argument upon which the paper is written, we are of opinion that the author's conclusions are based upon false premises.

In this industry pre-eminently monopoly is paramount, and rightly so. There is no use for more than one undertaking in any area. Development is dependent entirely upon cheapness of distribution, not upon competition between suppliers, therefore the energies of commercial men in the electrical world should be devoted to the cheapening of supply.

It is entirely due to the introduction of a factor that has given an enormous impetus to the industry that the necessity for vigorous action has arisen, but it is this very factor that has placed the industry in a position to oust the rival illuminant, for we presume it is the gas industry that the author has in view when he asks us to "note the competition to be faced."

At this date there are few but interested partisans who will contend that any competition exists between electrical energy and gas except in the cost of supply; therefore the principal question upon the advancement of electricity supply depends is, Can electrical energy be distributed more cheaply than gas?

There are many undertakings whose total costs have been halved during the past three or four years, and finality in cost reduction has not yet been reached. Can the same be said of gas undertakings?

We think the equilibrium has now been struck, but as soon as the balance falls in favour of electricity, advancement will be much more pronounced, and in direct ratio to this advancement the use of gas will decline.

The author's proposals do not lend themselves to cheap production. He does not state the size of a "large town," but we may assume that an authority at present supplying 8 to 10 millions of units for power and lighting per annum will come into this category. Such an undertaking can be managed for, say, £3,000 to £4,000 per annum, but he proposes to double this sum right away in order to advance business. Surely he must be aware that the building-up of electricity supply is of gradual development. Expenditure can only expand with the growth of business, and whatever the possibilities of a sales department may be, which will entirely depend upon local conditions, commercial prudence can only countenance commencing in a very humble manner.

The author's hire proposals are not at all clear; 30 per cent. of the cost is stated as the terms upon which hiring-out should be conducted. But what commodities are meant to be included? Arc lamps, vacuum cleaners and cooking and heating apparatus are specified at different rates. If wiring installations only are intended, we contend that 30 per cent. is too much, and will do more to retard than to assist the advancement of electricity supply.

Fifteen per cent. per annum for redemption of capital means disparagement of the work of present-day contractors. If the work put into an installation will not last ten years it should not be undertaken. But, in addition to assessing the life at 6⅔ years, 5 per cent. is added for repairs and maintenance. We should imagine that if the work is maintained at a cost of 5 per cent. each year it will not be necessary to renew at the end of 6⅔ years, or even 10 years. Five per cent. per annum interest when the original capital is repaid in 6⅔ years would mean over 100 per cent. profit. But a still further 5 per cent. is necessary, in case double the cost is not sufficient profit!

We quite recognise the fact that complete wiring must be carried out by supply authorities before the use of gas is abandoned, but an annual return of something in the neighbourhood of 12½ per cent. will cover all outlay on this account.

Furthermore, we do not approve of the proposal to borrow money for this purpose. The administration of loans for any period under 20 years is expensive, and the loan-sanctioning authorities are becoming alive to the fact. Probably, when supply authorities obtain the necessary power to carry on the work outlined by the author, it will be found that the money for the purpose must be taken from earned profits.

Reviewing the paper generally, apart from the extravagant schemes which we have commented upon, it is composed of commonplace platitudes which do not savour of originality, and in some instances are confutable. The author recommends the establishment of a most expensive wiring department, and yet suggests that the work should be confined to small orders. The proposition to allow contractors to deal with large orders, provided the materials are supplied by the authority, is nothing more or less than to suggest that the contractor should become a taskmaster for the benefit of the supply authority.

To create a position worth £400 per annum for which "at the moment there is a lack of suitable men," is a proposition that does not commend itself to business minds.

The belief that the work of a salesman and business organiser can be carried out efficiently by a man who must have spent the whole of his time in acquiring knowledge in a totally

different sphere before he could be designated a "good energetic engineer," and who could "soon become qualified to carry out the work," is an ideal that is likely to meet with disappointment.

Commercial Advancement of Electric Supply.

(*Abstract of paper by* A. C. Cramb, *Chief Electrical Engineer, Croydon.*)

In the past comparatively little attention has been bestowed upon the commercial development of electric supply, and more particularly does this refer to undertakings owned by municipalities.

The state of affairs in this country as contrasted with that in America is well illustrated by the following extract from some articles written by an American engineer as a result of a careful investigation of electric supply in this country:—"This condition is almost universal in Great Britain—aggressive work by the gas interests and procrastinating somnolence on the part of the electric departments."

Electric supply is as much a competitive business as any other; of primary importance is a thorough scheme of organisation of the commercial side of the business modified to suit the conditions of each particular undertaking.

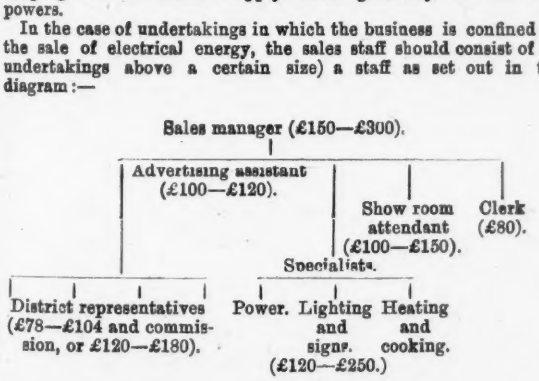
In undertakings of any appreciable size the duties of general management will occupy so much of the engineer-manager's time as to render it necessary to have a competent sales assistant, working immediately under his direction to control this portion of the business.

At the moment there is a lack of suitable men, but many engineers with natural aptitude for business-getting would soon become fully competent to carry out this work if many posts with a sufficiently remunerative salary were offered.

The public who have been educated by the gas companies to expect to be able to buy, hire and hire-purchase almost everything in connection with gas supply, naturally and rightly expect the same of electrical supply. Every manager of electric works can testify that gas companies are able to hold and extend their business on a scale which would be impossible were the relative positions on an equality.

Gas companies generally supply under the condition that increases in dividend are co-dependent on a reduction in price to the public. Rather than reduce the price of gas, however, gas companies use large sums of money which should go to the public in reduced price for gas in fitting up houses free, or nearly so, and in doing a great deal of work for the public with a view to keeping out the electric supply which generally has not such powers.

In the case of undertakings in which the business is confined to the sale of electrical energy, the sales staff should consist of (in undertakings above a certain size) a staff as set out in the diagram:—

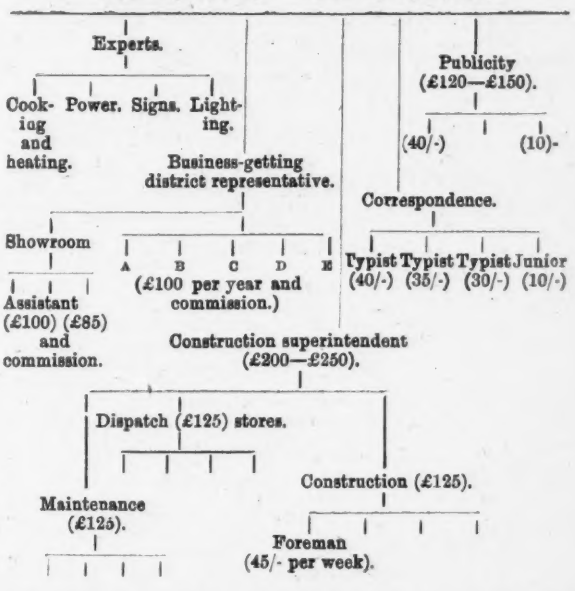


It is advisable to pay the manager a fixed salary. District representatives are generally, however, paid a salary with commission. The salary should vary from 30s. to 40s. with commission of 3½d. per 35-watt lamp, 2s. 6d. per B.H.P. in motors, and *pro rata* for heating and cooking apparatus. Some managers prefer, however, to pay a fixed salary of £120 to £180, as there is otherwise, they think, a tendency to overload a consumer. It is advisable to divide the area of supply into districts allocating a man to each district; each man should make an average of 30 calls per day, and a record be kept of the number of calls per order for each man; in one case this works out at nine. Where there is sufficient scope specially qualified men should be appointed for dealing with special applications, but they could only be required in large undertakings.

The advertising assistant's salary is sufficient, because literature and advertisements can be arranged through the Joint Publicity Committee.

The total cost of rent, rates, wages, advertisements, literature and all other expenses of the commercial department, are chargeable against working costs in undertakings run on these lines. The expenditure for commercial development under these conditions should be in the neighbourhood of 2 to 3 per cent. of the annual revenue.

When sales and installation departments are carried on, the staff engaged would be a much larger one; the expenditure on sales, installation, hire, &c., should be covered by profits on this work, but the remaining expenditure, including publicity, should be charged to working expenses as in the former case. The following diagram shows a suggested arrangement for such a staff of a large town:—



The salaries set against the different positions are a general guide, and a bonus should be paid, in addition, on net sales, disconnections being debited; on sales 2½ per cent. up to £450 turnover per annum, 5 per cent. between £450 and £750, and 7½ per cent. over £750. On hire and hire-purchases and maintenance schemes, the bonus suggested is 2½ per cent. on amount paid each quarter. On heating, cooking and other special applications, 7½ to 10 per cent. bonus on connections:—Lighting, 2s. 6d. per KW. up to 5 KW., in excess 1s. Heating and power, 1s. 6d. per KW. up to 5 KW., in excess 1s. Cooking, 2s. 6d. per KW. up to 2 KW., in excess 1s. The bonus paid in this case will be less as canvassers get bonus on sales also.

For hire a gross profit rental of 30 per cent. should be paid, made up as follows:—Redemption of capital, 15 per cent.; interest, 5 per cent.; repairs and maintenance, 5 per cent.; contingencies and other charges, 5 per cent. The hirer must pay for any breakdowns not due to fair wear and tear and fire insurance. The rental to include inspection and maintenance other than above.

For hire-purchase (two to five years) the list price of the motor, and a further 15 per cent. should be taken and divided into equal parts. Alternatively 25 per cent. of cost paid in advance, and the remainder in eight quarterly instalments, is a good plan if it can be arranged.

Arc lamps are hired at inclusive prices, and in one case the charge is £8 4s. per annum up to 800 hours use per annum, payments to be made in advance, 2½d. per lamp per hour being charged for excess use. Hour meters are installed at small rental. M.F. fittings should give good results on the same principle.

Electric vacuum cleaners, hired, including delivery, at a rental of 7s. 6d. to 10s. per day, should have a fair demand. Sales should be strictly maintained at list prices except to the trade. Cooking and heating apparatus must be hired at liberal rates to cover depreciation.

Showrooms.—It has been proved by actual experience that a central position in a good business thoroughfare must be selected.

Every effort should be made to get as many people as possible to call. The collection of accounts should be made from these premises, consumers having to walk through the showrooms to reach the cashier, so that existing consumers can be kept in close touch with new ideas and new apparatus.

If the premises are sufficiently extensive, it is advisable to fit up certain small rooms to demonstrate under normal conditions the varied uses of electricity in the household, and, in fact, every opportunity should be taken to so arrange the electrical apparatus that its operation can be demonstrated in such a way as to carry conviction as to the advantages of its adoption.

All articles should be clearly marked with the list price and the cost of current per hour, and a complete set of catalogues, price lists and illustrations, should be kept.

The showrooms should be in charge of a qualified man, and the outside of the premises should be well lighted by night; an illuminated facia helps to make the premises attractive, and will lead to orders for similar business.

A large sign projecting at right angles from the building, so arranged that the wording can be changed, will be found to be a great advantage.

Exhibitions at intervals have proved to give very satisfactory results in increased business when well arranged and run on business lines, and they are popular with the public. The out-of-pocket expenses should not exceed £50 to £100, according to the size of the town, and in many cases can be made to pay the entire cost.

Advertisements.—A good business-catching system of advertisements is essential to back up the canvassing staff and to carry on

the large work of educating the public to things electrical which is so necessary. This should be done by:—

(*a*) Eye-catching advertisements in the local Press, backed up by chatty paragraphs on new apparatus or work carried out. Church magazines are also useful for domestic applications.

(*b*) Posters on hoardings, which should be full of human interest and of artistic merit.

(*c*) Showcards distributed in contractors' windows.

(*d*) Artistic calendars distributed to tradesmen.

(*e*) Tramcar advertisements.

(*f*) Illuminated signs are, perhaps, the most effective of all if properly thought out.

Circular letters and pamphlets dealing with the various applications of electricity, got up in an attractive manner, should be regularly circulated amongst the householders.

A fair expenditure for advertising and publicity literature should be, in a medium-size undertaking, ·3 to ·5 per cent. of revenue.

A Joint Publicity Committee representing company and municipal electric supply interests has recently been formed, and it should, in time, have a very material influence in developing the electric supply throughout the country. The Committee will issue posters and pamphlets, and carry on all the work necessary for the purpose of commercial development of electric supply, and should be supported by every undertaking in the country. This Committee may, at a later date, act as a registry for the commercial staffs of the undertakings.

A good office system is necessary in connection with the business-getting department. A card system can be made good and efficient use of. A record of all premises should be kept arranged in street numbers alphabetically, and the cards in the order of the street numbers.

The back of the card contains a record of the date of calls, canvasser's initials, and the result of such calls.

It is further advisable to keep separate files of business premises, power users, &c., so that these consumers can be dealt with on special lines; a file of power users can be divided up into classes so that special handling can be effectively carried out. A file should be kept of information on all the various apparatus in connection with electric supply, so that particulars of any apparatus required and the cost of same can be quickly provided.

Canvassers should be provided with a book of data, likely to be useful to them, such as "Electricity for Everybody," by Matthews, or "Selling Electricity," and each day they should submit a report on calls made.

A close watch must be kept on new premises being erected, and it is important to obtain early notice of premises to let.

Considerable increase in lighting revenue can be obtained by two or three-year hire-purchase of installations, and, if financially sound, certain hiring schemes will also assist.

The larger power consumers will, of course, install their own machinery, but quite 50 per cent. of small power users can only be obtained by a proper hiring or hire-purchase scheme.

Heating and cooking is a branch of the business which in the past has not made much progress. Certain small lines, however, such as electric irons should be placed on 14 to 30 days' trial, and 60 per cent. to 80 per cent. should be sold. An electric iron should produce a revenue of 15s. to 25s. per annum.

Electric cooking is retarded more by the initial cost of the apparatus than by the cost of current, and a progressive scheme of hiring out is necessary.

Attempts at a more active business development of the supply undertaking has been accompanied by hostility from the contractors. There are two alternatives for the future, either co-operative arrangements between the contractors and the supply authority, or a vigorously conducted sales department by the latter. The author is of opinion that the sales department would bring a more rapid increase of business, and must be the final solution of the problem as already clearly proved by the experience of the gas companies, but the former scheme being properly supported might produce useful results.

If a co-operative arrangement can be effected, the supply undertaking should insist on seeing that, as far as their powers will carry them, good installation work is done and a fair price obtained. The difficulty of attempting co-operation, however, seems mainly to be due to trade jealously amongst the various contractors in any particular district.

Summarising, the object of the paper has been:—

1. To urge the necessity of a vigorous development campaign.
2. To indicate on general lines how this should be done.

Notes on the Commercial Progress of Electricity Undertakings.

Two years ago we had the experience of two members of the I.M.E.A. submitting papers of a somewhat similar nature, which led to the usual discussions following the same being merged into one, thus allowing members greater opportunities of enjoying the outdoor and social portions of the programme.

The papers this year are divided into two sections, Commercial and Engineering. In the latter section the subjects are similar, and can be discussed simultaneously. In the former section also both papers cover very much the same ground, a fact which, we think, is unique in the annals of the Association.

As there is no dearth of subjects for discussion in the electrical world, we must assume that municipal engineers are sadly lacking in enthusiasm for their profession. This ruthless pruning of the principal branch of these conventions, and the gradual dwindling of instructive matter, goes far to justify the action of the L.G.B. in surcharging the expenses of attendance against members.

We think the Council of the Association is somewhat to blame in this matter. It should be a practical proposition to fix the subjects for discussion longer in advance, and offer some inducement to the 416 members to contribute papers, from which a selection by competent judges could be submitted for discussion.

The paper by Mr. H. Collings Bishop is considerably appreciated by comparison with its immediate predecessor. It is a plain, straightforward statement of accomplished progress without the flourish of trumpets, and can be read without a conception of the big drum dinning in one's ears.

There is nothing "high falutin" about Mr. Collings Bishop, and a similar spirit to his abomination of red tape and his method of reducing everything to the smallest point, seems to exist in his manner of dealing with a subject that has been rendered nauseous by the new school.

We quite agree with the author in deprecating the American system of advertising, and the sooner this vogue is eliminated from our methods the greater will be the commercial progress of electricity undertakings in this country.

The author's remarks relating to payment by commission are worthy of consideration, and his statement "if a commission is necessary to make a canvasser look after your interest, get rid of him, he is of no use to you," is particularly pointed. A good man is certainly worthy of a proper salary, but we are inclined to think that an additional inducement in the shape of a moderate commission on approved business would be productive of better results to any undertaking than merely to "trust him."

In company work the author's summary method might hold good, but, in municipal practice, to "get rid" of an officer appointed by the Council is easier said than done. Security of tenure is one of the attractions of municipal employment, and as the tendency of to-day is to cut down salaries, we are of the opinion that the introduction of a sound bonus system that would apply to all concerned in municipal electricity supply, in producing as well as in selling, would assist progress considerably.

Another important point upon which the author touches is the length to which a canvasser may proceed in dealing with prospective consumers. There is in every borough a certain class of ratepayer who will only deal direct with the chief of the department. This business may be successfully angled for, up to a point, by a subordinate official; but the master hand is required to land the fish.

We commend the mode of procedure at Newport, where the canvasser reports daily to the chief, and discusses the work in hand. Happy is the undertaking possessing a chief who recognises that such is the only legitimate way to progress.

We do not think that the question of installation work would be a very debatable one were the author's views held by the majority of engineers. It is not only to the interests of an undertaking strenuously to oppose the jerry wireman and incompetent contractor, but to the interests of the legitimate electrical contractors themselves. It is essential that an undertaking should possess the power to do installation work in order to carry on this war of extermination, and to reach that class of consumer who will not or cannot afford to wire his own premises.

No sentimentality in this respect should stand in the way of progress. It is useless to expect the migratory tenant to pay the cost of wiring every habitation he may occupy; and

for a certain class of house, wiring may be looked upon as merely an extension of the service.

We note that Mr. Collings Bishop makes a more moderate estimate of a suitable return in the case of hire than the author of the preceding paper. This is fixed at 20 per cent. of the cost per annum, but in this charge apparatus is included.

It may be sound business to supply small motors on hire up to, say, 5 H.P., as a multiplicity of trades could thus be induced to adopt a motor drive that have hitherto not used power at all; but to go beyond this limit is probably to depart from the legitimate sphere of an electricity supply undertaking. At any rate, municipal authorities should well consider their position before laying themselves out to supply motors up to 50 H.P. And why draw the line at 50 H.P.?

We think a system of hiring, trimming and maintaining arc lamps would be a profitable source of revenue to many undertakings, but a separate charge for energy is a useless complication.

The author states that "charges for energy" is a fitting subject for a separate paper, but proceeds to give a very elaborate scale for various classes of supply.

We agree with his conclusions regarding a general flat rate and the maximum-demand system, and can assure him that every undertaking in the country is anxiously awaiting the paper that will embody a satisfactory principle of charging for energy. We believe we are on the verge of arriving at this principle. Several undertakings have, in blindly groping for the true system, hit upon something crudely approaching the ideal, but in all of the many systems recently introduced, there is something wanting. Chance is an element which must be eliminated, whether it relates to the quantity of energy used or to the quantity of power demanded.

A limiting device is not a good business proposition, and we have yet to learn that satisfaction is given to consumers where such devices are installed. A meter that will register the amount of energy used when an agreed amount of power is exceeded, thus enabling a penalty to be imposed for unauthorised use of energy, has, we understand, been produced. Should this be an accomplished fact, we may anticipate a speedy solution to the difficulty of arriving at a comprehensive scheme of charging.

The author's summary of the business obtained during the past three years is most interesting. That 710 new consumers could be obtained by the unobtrusive methods which he advocates must seem almost incredible to the advocates of American ideas.

£8,800 has been invested at a gross profit of over 20 per cent. We should like to have some idea of the author's costs against this income, and trust that this will be forthcoming later for publication.

Notes on the Commercial Progress of Electricity Undertakings.

(*Abstract of paper by* H. Collings Bishop, *Chief Electrical Engineer, Newport, Mon.*)

The past three or four years have seen the development of the commercial side of electrical undertakings to a far greater extent than at any previous time. Engineers have recognised the fact that they must pay as much attention to that side of the business as they have in the past done to the engineering side, so that at the present moment electrical engineers have practically double duties to perform.

In the undertaking managed by the author the progress made in the past three years is, in his opinion, satisfactory, but still open to many improvements, chief amongst which may be mentioned the question of showrooms. Like so many other towns, Newport has suffered from the difficulty of obtaining a proper site for a showroom, and is, therefore, still content with a back room as the only means of displaying electrical apparatus.

At the present time no town need suffer from the want of advertising matter, as plenty can be obtained free from the various manufacturers if one is prepared to push their goods, and there is more than one company in existence which is prepared to supply any amount of literature in return for the coin of the realm. As to whether advertising matter so obtained is suitable must depend to a great extent on local conditions. Personally, the author does not consider it altogether advisable to depend on matter made up in London as a suitable means of advertising, say, the Newport undertaking, 150 miles away.

The author does not agree with the American idea of advertising, which necessitates dumping a postcard or letter on your breakfast plate every day until, from sheer exhaustion, you succumb and give an order. This sort of thing can be overdone. In Newport the sending of numerous letters, postcards, &c., was tried for some time but the results were not nearly so good as when dealing individually with prospective consumers, and using judment when to give them a rest. Circularising specialities is another matter, and can very well be done in the first instance by circular, to be followed by a call showing the article you want to introduce.

Canvassing is the most important of all the departments connected with the commercial development of electrical undertakings, and those undertakings able to support a canvasser and illuminating engineer are, indeed, in a fortunate position and, given a good man, the committee will never regret the appointment. Payment by commission should not, in the author's opinion, be indulged in. It leads to the temptation to get work whether the prospective consumer is financially sound or not, and in the end the undertaking suffers; there is also dissatisfaction on the part of the canvasser where customers obtained by him are rejected on the score of financial instability or other cause.

The long and the short of it is, given a good man, pay him a proper salary and trust him. If a commission is necessary to make him look after your interests get rid of him, he is no good to you.

Two or three years ago the Newport Corporation appointed a combined canvasser and illuminating engineer, and the appointment has been an unqualified success; the mode of procedure has been as follows:—The canvasser works directly with the consumer or prospective consumer and reports daily to the chief the result of the previous day's work, and generally discusses the work in hand. By this means there is a minimum of delay in giving the prospective customer a definite reply, the canvasser becomes daily more acquainted with the policy of his chief, and is gradually able to deal more quickly with customers, and when the necessity arises of taking the responsibility of giving a decision on a matter at the moment, he is able to settle without feeling that he has taken any risk of disapproval.

Diplomacy is one of the adjuncts to the stock-in-trade of a canvasser which is important in the extreme; the author is rather inclined to think that it is not practised enough by our cousins over the Atlantic, whose motto seems to be peg away until your man gives in.

Installation Work.—This question is a very debatable one; there is no doubt that, were the field free, the electrical undertakings are in an excellent position for dealing with all the necessary installation work for their own consumers, and a good percentage of electricity users prefer that all repair and installation work should be carried out by the undertaking.

One is often asked, What is to become of the contractor? The author's reply would be that the properly trained and conscientious contractor has little to fear, but the man who becomes an expert in a night must, in the interest of the whole industry, go. A great deal of harm is being done by these men, and also by some of the large plumbers and ironmongers, who often put on an inexperienced man as electrical foreman and leave the whole department to him. The amount of work done is often large, owing, probably, to the reputation of the firm in their legitimate line, and the public naturally think that they are getting a first class job done. In many cases they are disappointed.

Motive Power.—In the author's case he has yet to find the consumer who discards electric power once he has started, except due to failure in business or other like cause.

It is, however, necessary to run the hire department upon business lines. Ten per cent. to cover interest and all other charges, based upon the cost price, is bound to end in a loss to the department. Neither does the author consider it at all necessary to make the hire rate very low in order to obtain consumers. In Newport there has been no difficulty in obtaining 20 per cent. return on the cost price.

It may be of interest to know the rates obtained in Newport for the hire of various sizes of motors. The figures given include a starter, switch and fuses, and wiring up to a run of 50 ft.:—

1 H.P.	... ...	£2 17 6	20 H.P.	... ...	£11 10 0
2 „	... ...	3 10 0	25 „	... ...	13 0 0
3½ „	... ...	4 0 0	30 „	... ...	16 0 0
5½ „	... ...	4 15 0	35 „	... ...	18 0 0
7½ „	... ...	6 7 6	40 „	... ...	19 0 0
10 „	... ...	7 5 0	45 „	... ...	21 0 0
15 „	... ...	9 15 0	50 „	... ...	23 0 0

Arc Lamp Hire.—This is a department that has not been started by a great number of undertakings, nevertheless it is one that has many points worthy of consideration. There are two chief reasons that deter consumers from installing arc lamps, viz., first cost and the bother of trimming and cleaning.

The author has found it most successful to undertake both duties, and in Newport there are at the present time 283 arc lamps on hire from the Corporation. The whole of these lamps are maintained by the Corporation for an inclusive fee per hour (in use) for current and carbons. In addition to these there are 55 lamps owned by consumers, but maintained by the Corporation at a given sum per annum, such sum depending upon the size of lamp and hours of use. There is no doubt that lamps so maintained give better results than when trimmed by the consumer.

The rates charged in Newport are as follows:—One 360-watt alternating lamp, 2d. per hour; one 400-watt alternating lamp with metal core carbons, 2½d. per hour; two 400-watt alternating lamp with metal core carbons, 5d. per hour; four direct-current metal core carbon 400-watt lamps, 10d. per hour. The above rates are for yellow carbons.

The rates charged for the hire of the lamps are as follows:—One alternating lamp and transformer, £2 8s. per annum; two alternating current lamps, £4 3s. per annum; four direct-current lamps, £6 18s. per annum.

Hire Purchase.—In this department we deal with almost any kind of apparatus that a consumer may require, for lighting, heating, and power, and we vary the payments from one year to five years as may be required.

The business done has been fairly good, without unduly pushing it; that is to say, if we think a consumer is prepared to buy outright we leave him to the contractor, but when we know it means deferred payments then we push the scheme for all it is worth.

The basis of charge varies slightly according to the class of apparatus purchased, but the general run is as follows, say for a five years' agreement:—

Payments per Quarter.—One-twentieth part of the capital; 5 per cent. interest on capital not repaid; 5 or 10 per cent. on total capital for maintenance.

Inspection.—The author is of opinion that some form of inspection is required, and the chief point to consider is, who is the right authority to undertake it?

Now that so many Corporations undertake installation work themselves, it is questionable if they are the right ones to do inspection of work that may be done by a competitor.

Charges for Energy.—It will be agreed to, by some at least, that a general flat-rate, although simple, is not satisfactory because it does not afford that flexibility that is necessary.

The maximum-demand system has been found wanting by many, and the town that has four pages of varying charges is laughed at by many engineers and grumbled at by the poor consumer, who does not know which to adopt. At the same time the author ventures to say that there must be a reasonable number of varying charges to permit him to satisfy the most difficult of prospective consumers that it will pay him to adopt electricity.

Gas Competition.—This does not exist to nearly the same extent that it did a few years ago. There is no doubt that the advent of the flame arc and the metallic-filament lamp has put quite a different complexion on matters. It is now strenuous fighting on the part of our rivals to prevent consumers migrating to a really healthy illuminant.

Where the competition really does exist is with the small consumer, who, at the present time, uses gas, oil or candles. Here there is a great field for activity.

The competition in street lighting is dead. The advent of the flame arc for main streets and the high candle-power metallic lamp for side street lighting has put that necessary finishing touch of superiority which makes it most difficult to raise arguments in favour of any other form of illuminant.

One is able now to successfully attack that stronghold of the gas company—heating, and the gradual increased consumption in heating units that is being made each year is bound to tell in time.

Free or Assisted Wiring.—Many schemes have been tried for inducing the smaller consumer to take electric light by offering to wire premises free or for a small rental; a better plan is to put forward the prepayment meter, and in Newport considerable success has been obtained in this line, some 50 to 60 meters having been put out during the past seven or eight months. This, however, does not overcome the difficulty of obtaining the very small consumer whose demand does not exceed two or three lights. Prepayment meters in these cases are no good because the revenue allowed in the charge made is not enough to make a sufficient return on the cost of the meter, and the author now puts forward for consideration a scheme for the inclusive rental of wiring and energy.

Whilst the plan proposed is going back to the system in vogue many years ago, still there is no reason that it should be a bad idea simply because it is old. Probably the greatest objectors will be the meter manufacturers.

Briefly, the scheme is as follows:—To charge a weekly rental for current and hire of fittings; to use a cheap form of surface wiring; a variable weekly rental according to the time of the year; an arrangement by which all rooms can be wired and a varying rate charged according to the number of lamps it is desired to have power to light up at the same time; a locking holder to minimise the theft of lamps; a scale of weekly rents is given for the varying conditions that may arise.

The charges shown on the scale are based upon the following rates:—Charge for energy, 4½d. per unit; capital cost for wiring (without lamps), 10s. per point; capital cost for each service, 20s.; capital cost of the instrument to prevent the use of more lights at a time than are paid for, 15s.; collection charges, 1d. per house per week; annual allowance per lamp for renewals, 2s.

The following is a list showing how the annual costs and profits should work out per 100 consumers, taking various classes so as to get a fair average:—

10 one light permitted and one point wired consumers—annual revenue	£11	16	8
10 two lights permitted and two points wired consumers—annual revenue	15	4	2
10 two lights permitted and three points wired consumers—annual revenue	16	5	0
10 three lights permitted and three points wired consumers—annual revenue	17	9	2
10 four lights permitted and four points wired consumers—annual revenue	19	10	10
10 two lights permitted and four points wired consumers—annual revenue	17	6	8
10 five lights permitted and five points wired consumers—annual revenue	£21	16	8
10 three lights permitted and five points wired consumers—annual revenue	19	10	0
10 six lights permitted and six points wired consumers—annual revenue	23	8	4
10 four lights permitted and six points wired consumers—annual revenue	21	13	4
100 consumers	£184	0	10

The cost per annum of running these 100 consumers would work out as follows:—

5,330 units at ·75d.	£16	13	1
Interest and repayment on installation costs	26	5	0
Interest and repayments on services	7	10	0
Interest and repayments on the proportion of plant and mains required (basis maximum demand 5·6 KW.)	21	0	0
Collection expenses	21	13	4
Lamps	16	0	0
Limiting apparatus and terminal costs	15	0	0
Total	£124	1	5
Net profit	£59	19	5

Allowing 20 per cent. in extra units for waste, the net profit is reduced to £56.

Since writing the above scheme, the author has come across an article on the proposals of the Fixed Price Light Co. The price proposed, viz., 2½d. in the summer and 3½d. in the winter, appears to the author to be too low when dealing with lamps up to, say, two in number. When that number is exceeded the two schemes appear to agree fairly well in price.

In conclusion, it may not be out of place to give a list of the business obtained during the past three years, which the author attributes to the results of commercial activity:—

Total number of new consumers obtained	710
Equivalent in 30-watt lamps	74,800
Total revenue from sales and wiring (mostly hire-purchase)	£8,101
Total number of arc lamps let out on hire	283
Total H.P. of motors connected to the mains:—	
Three years ago	1,080
At the present time	2,450
Total number of private arcs maintained by the Corporation on consumer's behalf	338

The annual revenue now obtained by Newport for goods or maintenance of apparatus supplied under the powers required for the purposes of commercial development are as follows:—

Annual receipts for motors on hire	£328
" for the hire of arc lamps	461
" on hire-purchase account	1,047
" for the maintenance of arc lamps	380
Total capital involved	8,800

Discussion.

The papers of Messrs. Cramb and Collings Bishop were discussed jointly.

Mr. A. H. Seabrook (Marylebone), who opened the discussion, said he was generally in accord with the principles outlined by the authors. As regards the work carried out by his sales department, he found it easy to get 45 to 50 per cent. profit on the gross cost, and did not think the wiring contractors could complain on such prices, of unfair competition. In the matter of hire-purchase, two years appeared to be ample time to allow for repayment; it was not safe to allow a longer period without strong guarantees. The payment down by the consumer of 26 per cent. of the cost of the installation was a good idea. The hiring out of arc lamps, and, indeed, all hire-purchase schemes, tended to bind the consumer to the undertaking. The ordinary stereotyped circular letter had little weight with the prospective consumer, but personal letters were appreciated. He found that some large consumers preferred hiring out motors from the Corporation, because it was an easy matter to exchange a motor if not suitable. In his opinion canvassers obtained better results if paid on a commission basis; as regarded the extension of business among small consumers, it was necessary first to get rid of the meter, as its cost was out of all proportion to the cost of the installation.

Ald. Crowther (Sheffield) referred to the efforts made in his city to popularise the supply. The most successful appeared to be the 1906 exhibition, which was visited by 30,000 people, resulting in between £1,100 and £1,200 receipts and a net loss at the time of £105. This exhibition was of the popular variety, and he thought its results were not apparent for two or three years. It had, however, resulted in the introduction of the electric furnace into the city, and many of these were now being connected up, the rates of supply being from 1d. to ·6d. per unit, according to circumstances. In 1909 the electrical department took a shop in a central position for a month, and some 30,000 people availed themselves of the opportunity of witnessing the various demonstration of ironing, cooking &c., Although the Corporation had paid some £8,000 for the goodwill of the trading and fitting department, the local contractors were opposed to municipal trading, and had obtained an injunction against them.

Mr. C. H. Wordingham thought that separate specialists for lighting, heating, and power were scarcely necessary in any undertaking; one man would surely do this work. As regarded advertising, the consumer wanted a clear statement of fact; he did not want funny pictures. Electrical engineers were not slim enough; they should take a hint from the gas companies' methods, as, for instance, the innocent articles which appeared in the daily papers. He felt strongly that it was unfair to encroach on the contractor's business in any way. Much trouble would be saved if in the smaller towns the electrical engineer were allowed to advise local consumers; in large centres it was necessary to employ a consulting engineer.

Mr. Vignoles (Grimsby) favoured the employment of canvassers on a commission basis, which, however, required carefully considering. In reference to Mr. Cramb's paper, the cost of the sales department (£2,000 per annum) appeared to be too much for the bulk of the undertakings in this country. Even if a sales manager or canvasser were employed, it was necessary for the chief to assist, as many consumers would deal only with him. Street lighting he had found advantageous, as it indicated to the resident the presence of an electrical supply in the street. While admitting that the joint committee were doing excellent work, he considered that it was necessary to keep in touch with the local conditions if all the requirements were to be met. One must not expect direct results from newspaper advertisements, but he considered that a joint scheme for advertising electricity in an impersonal sort of way all over the country, by means of articles in the daily papers, would do much good indirectly. The surveyors' departments were in a good position to give early information as to new buildings, and in the matter of hire-purchase schemes, both the receipts mentioned by the authors appeared to require explanation, and to be on the high side.

Mr. Frank Ayton (Ipswich) suggested that a radical departure from ordinary lines in canvassing, was advisable, viz., the employment of lady canvassers, as they were evidently better fitted to interview the lady of the house on most domestic matters. Possibly Mrs. Pankhurst might aid in the selection of suitable candidates for such a post. In Ipswich the Corporation did everything possible for the consumer, and from experience he had come to the conclusion that the contractor should not be allowed to stand in the way of progress in any way. The publicity work in this town was done by the sales department, which had a turnover of £3,043 last year, inclusive of free wiring work. The staff cost £300 per annum, equal to 10 per cent. of the installation department's revenue, or 1¾ per cent. of the total revenue of the electricity department. Installation work should be carried out at competitive rates; he got 28½ per cent. profit on the work carried out. The actual cost of wiring per point was 8s. 9d., or with all charges 13s. 6d., not including fittings, lamps, &c. It was policy to make friends with all the estate agents in the town, who could give immediate information as to premises vacated and let. In his town good results accrued from tramcar advertising, the distribution of postcards, pamphlets, &c., but it was necessary to discriminate in a matter of this sort. The important thing was to make the people think electrically.

Mr. Mark Ruddle (Dublin) and the succeeding speaker, Mr. E. E. Hoadley (Maidstone), both indicated their disappointment with papers which dealt with things which many authorities, including their own, had not power to carry out, and urged the importance of legislation to secure equal powers to all electricity suppliers. Electrical signs were well worth pushing, and, even more so, facia boards for shops, which were now only of use during daylight, but might easily be illuminated at night.

Mr. Long (Norwich) referred to the methods adopted in his city for popularising the supply. There were now over 4,600 consumers, which, he believed, constituted a larger proportion of the inhabitants than in any other town. To get over the difficulty of first cost in the case of metal lamps, he had agreed to accept 1s. down and the remainder in quarterly instalments, and this plan had succeeded, as over 1,000 lamps had been supplied in this way.

Both the authors briefly replied, Mr. Cramb pointing out that his schemes of organisation applied to a fairly large town and could be suitably modified for smaller ones. He had found contractors usually satisfied with a drifting policy, and Mr. Collings Bishop also agreed as to the lack of push of the local contractor who neglected the auxiliary apparatus, which the Corporation successfully dealt with.

Electrical Fatalities.—An inquest was held at Ashton-under-Lyne on the 9th inst., relative to the death of James Mort, electric crane driver at Messrs. Scott & Hodgson's, Ltd., engineers, Guide Bridge. According to W. Clarke, foreman moulder, a 20-ton segment of a fly-wheel was being cast, when a portion of the molten metal and sand blew up into the air. Mort was working on the overhead electric crane some distance away, and in his eagerness to get clear, he touched two live electric cables and received a shock at about 250 volts. According to the medical testimony, deceased was severely burned about the hands, arms, face, head, neck and chest. Deceased had stated while in hospital that he had been burned by the flying molten metal and sand. A verdict of "Accidental Death, the result of contact with electric wires," was returned.

Dundee New Laboratory.—The new Peters Laboratory of Electrical Engineering at Dundee College will be formally opened in October.

CORRESPONDENCE.

Letters received by us after 5 P.M. on Tuesday cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.

Packing for Abroad.

I was very interested and pleased to read an article on the above in your paper of May 6th. Nothing can be more disheartening and annoying for engineers in this country than—after waiting some six months for machinery from home—to have the same arrive out in a damaged state due to bad and careless packing, and to be compelled to wait some six months more for the damage to be made good.

I have been very much inconvenienced, and have had several important schemes seriously delayed owing to bad packing by home firms, resulting in machinery being received damaged, and this has been in some cases so marked, and has occurred so frequently, that I have been compelled to discontinue placing orders with some firms.

I feel sure if home firms would only realise the importance of strong and careful packing for abroad, and keep a competent department specially for this work, they would soon derive the benefit in the increase of their export trade, as it must be obvious that engineers will fight shy of firms from whom they are continually receiving damaged goods.

In one case in point, I was seriously handicapped owing to a consignment of electrical plant arriving out in India in a damaged condition owing to careless packing. On the switchboard alone some 25 instruments were completely smashed owing to the panels—to which they were fixed—barging about in their packing cases during transit. These had to be returned to the makers, and it was nearly a year later before same were received out again, and, consequently, the scheme on which I was then engaged was delayed over six months, to the great inconvenience of all concerned.

The cost of replacing and repairing the damaged goods in this one consignment was over £250, out of which not one penny was recovered from the shippers and other people concerned. The above is only one case of many, and it is quite a usual occurrence to receive machinery out in India with the bright parts thick with rust.

Referring back to the article, I notice that the writer has given some information *re* different methods of packing for India; to these I will add that, in packing instruments and electrical plant—which will be damaged by moisture—a drying medium should always be packed in the same case to absorb moisture which will accumulate owing to the goods sweating in their tin-lined cases during the voyage out; also all bright parts of machinery should have at least three coats of a good anti-rusting paint before being packed.

To conclude, I will add that it is practically useless to paint on cases, "This side up with care," &c., as with coolie handling in India all cases are treated alike, and such goods should be carefully and strongly packed to withstand shocks and handling from any side, by the packing department.

G. R. Drummond, M.I.E.E., &c.,
Engineer.

Rajputana, India,
May 24th, 1910.

The Prevention of Rust.

We have been much interested in reading a letter on the above subject by your correspondent, Mr. A. J. Bousfield, in your last week's issue, and we should like to have the opportunity of emphasising the importance of this question of rust in connection with, not only traction systems, but steel work of every description. It should be generally understood that mild steel, which has now replaced to such a large extent the use of wrought-iron, is in a special degree liable to active corrosion, more especially in the large manufacturing centres. One theory regarding this is that mild steel is purer than wrought-iron, while another is that physical changes occur in the micro-structure under alternating stresses, such as are to be found in most engineering constructions liable to live loads. Whatever may be the cause, there appears to be no doubt that corrosion is nowadays

proceeding at a more rapid rate on constructional material than was the case when cast-iron and wrought-iron were in use.

The coating of iron and steel by means of ordinary lead paints with a linseed oil base is not a sufficient preventative against this action for long continued periods, as although in the first place the drying of the linseed oil produces a thin elastic film over the metal surfaces, action unfortunately does not stop here, and the chemical changes proceeding after the oil is dry eventually produce a porous solid substance which moisture can easily penetrate. Coal tar and preparations made therefrom are a step in advance, but there appears to be a good deal of danger with tar acids remaining in the material. In this way such protective coverings, although at any rate for a time eliminating atmospheric corrosion, have themselves a corrosive property, and a fine coating of rust forming under the paint owing to this acid action eventually disintegrates it and lets in the atmosphere. Pitch and preparations therefrom are very good for material which is absolutely inert, but not so good for structures which are under shock of live load, inasmuch as pitch is very brittle, especially in cold weather, and usually flakes away.

The above considerations show that what is required is a film of protective substance which shall be continuously elastic, chemically and physically inert to iron and steel, thoroughly water-proof and unaffected by exposure to ordinary weathering conditions, and to the traces of carbonic and sulphuric acids which are usually contained in the air of manufacturing centres. This is, of course, a difficult programme to fill, but from our experience up to the present with a very excellent, but little known, protective medium called Anthrol, we are inclined to believe that this substance, which is manufactured by a Glasgow firm, fills the conditions very satisfactorily. We think the more of it because it appears to be obtaining considerable use in spite of the fact that it is very little advertised.

We are, however, of the opinion that the whole solution of the question does not rest with the nature of the protective substance applied, but also with its method of application, and one of the features impressed upon us in much of the modern painting is the careless way adopted for clearing away rust and factory scale from engineering structures before they are painted. Without such precaution it is quite impossible to obtain efficient protection.

Another thing is that efficient supervision does not appear to be exercised in every case over the workmen, and it is not unusual to find that painting is carried on in a slipshod manner frequently in rainy weather, or immediately after a rain storm while the surface of the structure is still wet, and sometimes, when two coats of protective paint have to be applied, the second is laid over the first before the former has had any chance of getting thoroughly dry.

In view of the very rapid deterioration of steel structures which we have noticed, particularly in an area such as the north-eastern counties where factory gases produce a serious effect, we think that Mr. Bousfield's letter is very timely, and trust that it may be influential in arousing public interest in the question.

Pro **Fount,**
W. Ormrod.

Newcastle-on-Tyne, *June 10th*, 1910.

The Calculation of Illumination.

With reference to the article by Mr. C. Toone in your current issue, I should be obliged if he could explain why it is that, as shown in Curves 2 and 3, p. 961, the illumination in candle-feet *abruptly drops to zero* at distances 10·93 and 31·08 ft. horizontally distant from the source suspended *d* feet above the plane considered.

Again, in paragraph 2, p. 960, he refers to "*minimum* illumination," and says: "Let the point most remote from the source," &c. Surely the most remote point is at an infinite distance? Anyhow, it will be a convenient arrangement if he has discovered some method by which the illumination drops to zero at certain places.

Possibly it was this "zero of illumination" which was referred to by Moses regarding "darkness which could be felt."

M. F. H. W.

Printing Installations.

With reference to your very interesting issue of the 3rd inst. in connection with printing installations, we notice an article by you on page 914, where you state that the *Leicester Mail* is unique in being the first newspaper to be produced by power furnished from the tramway circuit.

We presume you do not mean simply the first newspaper in Leicester, and therefore feel sure that you will be interested in knowing that the *Western Morning News*, of Plymouth, have been using the tramway circuit for operating their newspaper machines on the "Holmes-Clatworthy" system since early in 1903, and this was so satisfactory that the plant was shortly after duplicated.

Not long after, the *Western Daily Mercury*, of the same town, also installed two equipments on the same system for driving their newspaper machines off the tramway circuit.

We have also several other equipments of the same kind working on tramway circuits in New Zealand and South Africa which have now been running for some years.

With regard to the operation of newspaper presses by single-motor push-button control, we presume that this is not claimed as novel, as, of course, there are several examples of this sort of thing in the country.

J. H. Holmes & Co.

Newcastle-on-Tyne, *June 13th*, 1910.

The Election of Council of the I.E.E.

Will you allow me to make a few comments upon the recent election of the Council of the Institution of Electrical Engineers, from an entirely detached point of view?

The editorial criticisms in your paper, and the comments made in some letters contributed to your columns, show, to my mind, conclusively one thing—and that is, that the alterations which were made in the articles of association of the I.E.E. in 1903 and 1904 do not quite meet the needs of the situation. If it is considered to be desirable that the general body of members should have a direct voice in the selection of candidates for office, the rules should provide that that choice can be exercised without offence being given in any quarter, and upon terms which will make that choice equally effective with the choice made by the Council.

That the exercise of this choice should be interpreted by any members as involving a vote of want of confidence in the Council is most unfortunate, and yet, according to my experience, action under these rules always is so interpreted.

The chief criticism has been directed against the suggestion that the name of a particular nominee of the Council should be scratched out on the polling paper. We can all be agreed as to the unpleasantness of such a method of furthering the object in view, but it appears to me that it is the system of election which is at fault, and it, and it alone, must be directly blamed for all the unpleasantness. If we analyse the situation without regard to any personal element, we find that, in effect, the general body of members are divided into two parties by any action taken under the rules relating to nominations made by members outside the Council. The division is between those who desire to support the Council and those who do not. Of course in the abstract this should not be the case, but speaking as one who has been hon. sec. of quite a number of clubs and societies, athletic and scientific, I have found that, among those who are sufficiently interested to vote at all, the voting all takes place on these party lines under such conditions. Now, if this be admitted, every supporter of the Council knows what nominee to scratch out on his polling paper, and knowing that, a little elementary mathematics will demonstrate that the supporters of the Council are placed at a great advantage compared with the supporters of the outside nominee, unless the latter also agree among themselves which nominee to scratch out. The movement on the side of the Council is automatically organised, so that such voting power as they can command is concentrated to produce the best effect. If the conditions are to be equal the supporters of the outside nominee must also organise for the maximum effectiveness. I am not defending Mr. Chamen; those who know him would realise that he would be incapable of acting otherwise than according to his conception of the highest standard of conduct in such matters, but I am concerned, and I am sure that you are,

Sirs, as well as others who have taken part in this discussion, that the most complete harmony possible should rule amongst the members of the Institution and its Council. It is upon that harmony that its vitality and well-being so largely depend.

I therefore plead for an alteration of the articles of association upon some such lines as those adopted by the American Institute of Electrical Engineers. I think that a "general proposal list" made up from proposals put forward by all the members, from which the Council can make their own selections, might meet the case. As many of your readers will know, the "General Proposal List" is printed side by side with the directors' nominees in the case of the American Institute.

There will, no doubt, be some who will regard the arguments of this letter as consisting of a kind of specious sophistry, but I trust that others will think differently, and that we may find a common basis of agreement that will strengthen the Institution of Electrical Engineers, which most of us value very highly.

Edw. W. Cowan.

London, E.C., *June 8th*, 1910.

[With most of Mr. Cowan's letter we heartily agree, and with him we deplore the fact, which we do not dispute, that any action such as that referred to generally divides the members into parties for and against the Council. This result should not follow. It might possibly be avoided or at least minimised if members who wished to nominate candidates were to send in their nominations, duly supported, before the Council's list was issued, and if no distinction were made in that list between the Council's nominees and other candidates. It is this distinction, we believe, which is at the root of the trouble.—Eds. E.R.]

Inspection of Coal Mines.

I expected more correspondence on this subject, and, with "F. W. A.," deplore the evident lack of interest. "F. W. A." and "H. M. P." support their contentions by little anecdotes. I shall be glad if you will allow me to do likewise.

Myself and His Majesty's Inspector of Factories travelled together on a tramcar. The Inspector was on his way to take a humidity test at a mill. On the way his instrument fell and got broken. I know the millowner, and out of curiosity asked him, some little time after, how things went on. He replied that he had never had such an awful report before. This Inspector was, before he married the Mayor's daughter, a junior clerk in the Health Department at a Town Hall.

Another of H.M. Inspectors of Factories went on top of a boiler under steam, measured up the safety valve, weight and length of lever, and after doing a little sum in a minute pocket-book, announced that steam could not possibly blow off before 120-lb. pressure was reached, notwithstanding that the fireman said that the insurance company only allowed 80 lb., and that the blow-off pressure was really 75 lb. The Inspector actually reported the firm on the strength of his measurements and calculations. Possibly, to him, the valve and levers had no weight, and cast-iron weights no blow-holes.

"Colliery Electrician" will possibly not be interested in boilers and humidity, therefore just another little story for his benefit. H.M. Inspector of Factories, quite rightly, ordered an open-type starter, working on 440 volts D.C., to be covered in. A wooden cover was made with a slot cut in it to allow the springs on the starter arm to project through the cover. H.M. Inspector at his next visit passed it as being a very good job. On the other hand, the insurance inspector started laughing (the "bounder"), and gave it as his opinion that, as the springs were "alive," the starter was now more dangerous than before.

In your issue of the 20th ult., "H. M. P." does not say if the inspector he mentions was a fire insurance man or not. Needless to say, I did not advocate fire insurance inspectors as inspectors of coal mine generators, motors and cables.

In the same issue "F. W. A." mentions another inspector. Now, how does he know that the inspector did not report the cables to his company? He also says he was far from thinking that a Government inspector could have prevented the West Stanley disaster. "Then why have one?"—I seem to hear "H. M. P." and "Colliery Electrician" asking. I do not profess to be an authority on insurance, but, as I first drove an electric coal-cutter 16 years ago, and sat for, and obtained, a first-class colliery manager's certificate 11 years ago, I claim to be able to form some opinion on matters connected with mines and electricity in mines. "Colliery Electrician's" questions were almost purely insurance statistics, and had practically no bearing on the subject under discussion.

From inquiry I gather that insurance inspectors have practically no chance of promotion, as there are no grades of service (I do not refer to fire insurance inspectors), and their salaries increase automatically; so that "H. M. P.'s" contention that it pays them to find faults or manufacture them is without any foundation. To close the discussion I may say, from inquiry I have made lately, that there will be Government Inspectors appointed, but they will not be pitmen. They will be, or, to be correct, are already, chosen, if my information is correct, from the staffs of one or other of two power companies operating north of London. They are all, to a man, three-phase-armoured-throughout-Merz-Price-protective-system-power-supply enthusiasts.

Here is another job for the Institution of Mining Electrical Engineers.

P. A. D.

Free Trade or Protection.

In your report in this week's issue of the debate on this subject, Mr. W. G. Bond quotes with assurance a sentence from Adam Smith, the inference being that Adam Smith was a Free Trader in the sense of being in favour of free and unrestricted imports.

Mr. Bond's remark is illustrative of the danger of selecting one sentence favourable to his own point of view, and giving it forth as representing in the widest sense the author's view on a very complex subject. To show how misleading such a course may be, I venture to quote a few sentences from Smith's "Wealth of Nations," which, if read without reference to other parts of the same work, would give the impression that Adam Smith would be a strong opponent of our Fiscal System as it exists at present.

The real fact is that Adam Smith was a Free Trader in so far that he desired the removal of all artificial restraints on trade, *i.e.*, restraints both on exports and on imports. To represent him as being in favour of free imports while heavy restraints are placed on the freedom of our exports to foreign countries, is simply a perversion of fact to suit a particular argument.

Archibald Wilson.

Edinburgh, *June 11th*, 1910.

Extracts from Adam Smith's "Wealth of Nations."

Book IV, Chap. II.—"Of restraints upon importation from foreign countries of such goods as can be produced at home."

There seem, however, to be two cases, in which it will generally be advantageous to lay some burden upon foreign, for the encouragement of domestic industry.

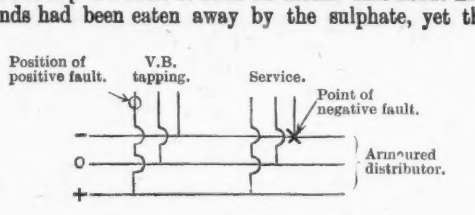
The first is, when some particular sort of industry is necessary for the defence of the country. The defence of Great Britain, for example, depends very much on the number of its sailors and its shipping. . . . The second case in which it will generally be advantageous to lay some burden upon foreign for the encouragement of domestic industry, is when some tax is imposed at home upon the produce of the latter. In this case it seems reasonable that an equal tax should be imposed upon the like produce of the former. This would not give the monopoly of the home market to domestic industry. . . . It would leave the competition between foreign and domestic industry, after the tax, as nearly as possible upon the same footing as before it.

The case in which it may sometimes be a matter of deliberation how far it is proper to continue the free importation of certain foreign goods, is when some foreign nation restrains, by high duties or prohibitions, the importation of some of our manufactures into their country. . . . There may be good policy in retaliations of this kind when there is a probability that they will procure the repeal of the high duties or prohibitions complained of. The recovery of a great foreign market will generally more than compensate the transitory inconvenience of paying dearer during a short time for some sort of goods.

Localisation of Faults on Underground Mains.

I note in the issue of the Electrical Review, June 3rd, an abstract from Mr. W. A. Toppin's paper *re* above in which he describes a method of locating faults by the rise of pressure in the vicinity of the fault; this, I think, cannot be relied upon, for a great deal will depend upon the nature of the ground, and, in some cases, the soil in the vicinity of the fault is such as practically to insulate the cable. To illustrate this I will quote a case which happened on the system of mains over which I have control.

A negative fault developed, which was localised to a length of distributor, the position of the fault testing to a point near which a tapping was, and also a service, as shown. The faulty distributor was lead-covered armoured laid direct, the tapping V.B. drawn-in, on a road crossing. The fault was found to be on the negative service joint, and on the positive of the V.B. at the point where it entered the conduits, a piece of about 4 in. had been left direct in the ground; this had developed a fault to such an extent that about half the strands had been eaten away by the sulphate, yet the



distance between these faults was only 3 ft.; the lead of the faulty cable passed the faulty positive within 1 ft., and although a pressure of 460 volts was between the two, no short-circuit had occurred. In fact, the positive cable showed no indication of a fault on being tested, the test on it with a 1,000-volt set being over 1 megohm, and this positive cable was used as the test cable, which clearly shows that its insulation to earth was O.K.; otherwise, a true location test could not have been obtained.

It is probable also that the above-mentioned test would be upset where water valves, hydrants and such like conductors rose nearer to the surface.

Again, the author admits that there are cases when this method does not act, so why have a method upon which there is a doubt, when a simple fall of potential method will always give the required results? The advantage of keeping the distributor alive is not of any great consequence, for if things are as they should be, the large power consumers will be taken off a T box so that the supply can be maintained from either end, and 10 minutes at the most should be sufficient to take the fault test.

Also the system of burning out faults on consumers' premises is not one to be recommended, for there is always the risk of firing the premises; large consumers should have all wiring run in tubing, which should be connected to earth *at one point only*, and this through a fuse, then when the recorder shows that an earth has been on, these fuses can be inspected, or if one wishes to go further, a resistance can be placed in parallel with the fuse, and a lamp placed across this would then indicate at once, and the works could notify the station.

As regards momentary shorts of insufficient duration to blow the section fuses, recording ammeters on each feeder, or tell-tale pointers on the ammeters, tend to the localisation of these.

H. P. M.

Technological Examinations.

I have read with much interest your notice of the report of the City and Guilds Institute. With reference to the Examiners' remarks on the Electrical Engineering and Telephony examination papers being so bad and the teaching being so defective, is not the fault to be found in the fact that the questions seem not to be set for the class of students who sit for such examinations? These students are mostly *evening* students attending classes three evenings a week, and have little leisure for home study. Might not questions on laboratory work be set? At present they are conspicuous by their absence. With reference to the bad teaching, the teachers in the Telegraphy and Telephony Classes are all practical men engaged in either the P.O. or the N.T.C.

With reference to the defective teaching in the Electrical Engineering classes, is it not a fact that a B.Sc. (Eng.) London, without works or teaching experience, is looked upon with favour by the Institute as a qualification for recognition as a teacher, rather than a second-class full technical certificate holder with works and some years' teaching experience? The requirements for recognition are far too academical; also it does not follow that a successful candidate for a teaching post will be accepted by the Institute as having sufficient qualifications. It would be interesting to know who decides as to the fitness of a candidate for recognition. With reference to the second or specialised paper in Honours Electrical Engineering (Part II), might I suggest a greater choice of questions? Six seems far too few considering the title of the section, "Instruments and *other apparatus*."

Technical Teacher.

Electrical Fatalities in Mines.

With regard to Mr. F. A. Scott's letter *re* the dangers of alternating current in mines, it is absolutely necessary to go into the details of any accident to prove that alternating current is more dangerous than direct current; the very fact of its being considered more dangerous, has made it safer, when installed and maintained by efficient engineers. Concerning your question at the end of your note, I am afraid the Institution of Mining Electrical Engineers will never do anything to prevent so many fatalities until they raise their status of membership; but when they commence to enroll by a diplomaship, I would like to ask, what will be done with all the present members who are not, nor ever will be, electrical engineers?

F. W. A.

St. Helens, *June 12th*, 1910.

Tungsten Lamp Patents.

Reference has been made in the Press to the pending litigation between ourselves and the Osram Lamp Works, Ltd.

In the interests of the trade generally, we are writing to request you to insert this letter in your next issue, inviting anyone attacked to put themselves at once in communication with our solicitor, Mr. Jonathan E. Harris, of 95, Leadenhall Street, E.C., who is defending the action on our behalf with the approval of the Messrs. Phillips Metallic Glow Lamp Works, Ltd.

G. M. Boddy & Co.

London, *June 13th*, 1910.

I.E.E. Students' Annual Visit.

At the present time there are many questions on which members from the various local Students' Sections would like to exchange opinions. This could be done informally during the annual visit; but such private discussion will not produce any really beneficial results for the section as a whole. If one or more special formal meetings (with a definite agenda published some time before the visit) could be arranged for the discussion of these questions, members going up could go prepared to speak authoritatively from their Section's standpoint.

One of the questions which might well be thoroughly and formally discussed during the forthcoming visit is the matter of attendances at meetings, and means for considerably increasing these. An examination of the figures for the last few years shows that both London and Manchester attendances have a decided tendency to decrease. At Manchester the matter is, and has been, seriously engaging the attention of the local Committee, and no doubt the same can be said of London. To have a general discussion on the matter, therefore, seems most opportune, and would certainly seem likely to be of some real value, particularly to the committee-men.

Then there are questions relating to the printing of papers and to the increasing of the usefulness of the section to its members and of its members to one another. These are questions with which the London section has to deal chiefly, and it would be an excellent opportunity for the managing committee in London to ascertain exactly the views of mem-

bers outside the London local section. With this end in view, the matter on the agenda could be discussed locally beforehand, and delegates appointed, from local members taking part in the visit, to speak on behalf of their section and make known its views as a section. These delegates could report the views of the other delegates on their return and say what had been done towards a solution of the various problems.

There is just sufficient time to arrange this if members would make known their views at once regarding this suggested conference. Should the concensus of opinion be favourable, no doubt the committee in charge of the visit arrangements would arrange to hold the meetings and prepare the agenda from the suggestions of interested members. This agenda should be in the hands of the local committees, and preferably in the hands of all intending visitors, at least a week before the visit commences, so that local opinion can be collected by the delegates and the local committee meetings held.

I hope that members will make known their views, and trust that it will be possible to hold such a conference next month.

H. A. Carney.

Manchester, *June 13th*, 1910.

Lightning Effects.

During a very heavy thunderstorm experienced in this district on Thursday evening, the 9th inst., several of our consumers supplied from a three-wire D.C. system, with middle wire earthed at the station, voltage 230, had the filament of one or more of their carbon lamps broken.

In one case lightning struck the front garden of the house and overthrew some heavy rockery, and although the lamps were not alight at the time, it was found upon going to light them that the filaments of two of them were badly broken, but no fuse had blown.

In another case three lamps failed, although not alight, and in one of them the leading-in wires were twisted out, so that they almost touched the glass; in this case also no fuse had blown.

A third and very similar case occurred in quite a different part of the town.

In neither case did damage result to flexibles or other parts of the installations.

I should be glad to know if any of your readers have heard of a similar instance of lamps being broken during a thunderstorm when not switched on.

C. F. B.

Flame Arc Lamps—Carbon Deposit.

Referring to "Inquirer's" letter in your current issue, respecting the action of the fumes from flame arc lamps on his window panes, I do not think the carbon deposit has anything to do with it; it is more likely that the fluorine gas emitted from the carbons attacks the glass, actually etching the surface. If a clear globe is used with these lamps, practically the whole of the interior very soon becomes frosted. This is a very serious objection to the flame lamp, as, in order to maintain its efficiency, globes must be frequently renewed. It is very desirable that a practical remedy to this difficulty should soon be forthcoming.

T. G. L.

I notice in your "Correspondence" column last week that "Inquirer" is having trouble with the deposit caused by flame arc lamps on his window. I find, myself, the best thing to use is Monkey Brand soap for cleaning the globes of arc lamps. I should advise "Inquirer" to try the soap for his window.

H. P.

Lightning.—The electrical disturbances continued last week-end, lightning flashes occurring in various parts. St. Peter's Church, Canterbury, was struck while morning service was in progress on Friday last. A resident, according to the *Daily Mail*, saw "a blinding glare, which assumed the shape of a roll of fire." "The flame described two semicircles, and then made straight for the church." Seventeen sheep were killed by lightning near Bicester, Oxford.

LEGAL.

National Electric Construction Co., Ltd., *v.* Canterbury Corporation.

At the Canterbury County Court on June 7th, before Judge Haigh, an action was brought to recover the sum of £25 12s. 9d.

Mr. H. G. Robertson, for the plaintiffs, said it was an action to obtain a decision upon an agreement entered into between the company and the Corporation in 1898 with reference to the installation of electric fittings in various houses in the town. The Corporation supplied the town with electricity, and it was to the advantage of the Corporation to obtain as many consumers as possible. The effect of the agreement was briefly that the plaintiffs should install fittings and wire the houses without charging the Corporation or the person anything. In return for this "free wiring," as it was called, the Corporation undertook to pay to the plaintiffs a 1d. per unit for all current supplied to houses in which the plaintiffs had fitted the installations. In the agreement it was provided that if the Corporation liked they might charge the consumer the extra 1d. which they were to pay the plaintiffs. The company based their claim upon the agreement irrespective of any arrangement which the Corporation made with consumers. It appeared that certain persons whose houses were wired entered into an agreement to pay the extra 1d. Those persons eventually left, and the tenants who followed them refused to enter into a similar agreement. The Corporation said they were not bound to pay the company the penny unless they recovered it from the persons who used the light. The company held, however, that the Corporation were bound to pay them the money. A number of accounts were handed in, and the counsel explained that the Corporation sent quarterly accounts to the company setting forth the names of the "free wiring" consumers and the number of units supplied. A document dated June 1st, 1904, showed the payments less that by a consumer named Saunders, who, it appeared, had not paid the extra 1d. per unit.

Mr. Josephs, for the Corporation, argued that when once the person who had entered into an agreement to pay the Corporation, as a conduit pipe, through whom that 1d. was to go to the wiring company—left the house, the new tenant was in a position to refuse to pay the extra 1d. The Corporation were, therefore, no longer under the liability to pay that money.

His Honour said that, if that contention were correct, the company would probably not get a third of the money they had spent in fittings. His Honour inquired, if they did not get the money from the consumer, how were the fittings to be paid for?

Mr. Josephs intimated that there was no provision in case the first tenant left. All the people from whom they were now claiming were not the original consumers. In every case, said Mr. Josephs, they had tried to get payment from those persons, but had failed.

Mr. Robertson contended that the word consumer meant a person who consumed electric light. The defendants said they could not recover the amount, but that was entirely their affair. They could sue the consumer if they wanted to. The agreement was that the Corporation should pay the company.

At this point his Honour intimated that he would forward his judgment to the Registrar in due course.

Thornton *v.* Stalybridge, &c., Electricity Board.

At the Hyde County Court, on the 8th inst., an action was brought before Judge Reginald Brown, by Mrs. Eliza Thornton, of George Street, Hyde, claiming £50 damages against the defendants. The evidence for the plaintiff was to the effect that at a junction a car was stopped and the trolley left the conductor and broke a span wire. This wire struck the plaintiff in the eye, with the result that she was under medical treatment for about 10 weeks, and was not able to follow her employment as a weaver during that period.

Mr. T. Eastham, for the Joint Board, called evidence to prove that the Board's servants had exercised every reasonable care in following out their duties.

His Honour, in giving judgment for the Tramway Board, with costs, said it was a mistake for people, when an accident happened, to take it for granted that they had a cause of action.

Price Bros. *v.* Cuban Telephone Co. and Others.

In this case in which it was sought to restrain Messrs. Chaplin, Milne, Grenfell & Co. from parting with, and the Telephone Co. from receiving, sums that had come to their hands in respect of 5 per cent. first mortgage bonds of the Telephone Co. was mentioned to Mr. Justice Parker in the Chancery Division again on Friday, June 10th.

Mr. Howard Wright reminded his Lordship of the nature of matter, and said that the two further actions had now been launched.

Mr. Bischoffe, for Messrs. Chaplin, Milne & Co., said that as soon as the undertaking was given the previous week his clients sent out a circular letter to persons interested whose addresses they knew, stating the terms of the undertaking, and he was quite prepared to give a similar undertaking in all the actions until trial.

Mr. H. E. Wright, for the Telephone Co., said that he had no objection to the undertakings being given if the costs of the

motions were reserved, but he desired to protest against this multiplication of motions which he submitted ought never to have been brought.

Mr. Bischoffe said that as soon as the first action was started, a number of other bondholders had either commenced, or were about to commence, actions, and it might be held that they were guilty of *laches* if these motions were not brought on: in fact, *laches* was one of the defences that had been raised to the actions now before the Court.

His Lordship said that all he could do was to accept the undertakings in the actions now before him, and reserve the costs of the motion, but he intimated that under the circumstances he did not think that any further motions ought to be made.

The Reorganisation Control Syndicate, Ltd., *v.* The International Motor Traffic Syndicate, Ltd., and The Brighton, Hove and Preston Omnibus Co., Ltd.

In the Chancery Division, on Friday, June 10th, before Mr. Justice Swinfen Eady, this action was mentioned on a motion for an injunction to restrain the defendants from parting with or disposing of eight electric omnibuses or the parts of them. Mr. Ward Coleridge said the International Co. had already parted with the 'buses to the Brighton Co., and, therefore, he asked for no relief against the first-named defendants. Mr. Ashton Cross, who appeared for the Brighton Co., undertook that the omnibuses should not be delivered up to any other person than the plaintiffs without giving seven days' notice. All parties consenting, his Lordship directed, with a view to a speedy trial of the action, that the plaintiffs should lodge the statement of claim within seven days, and that the defence should be lodged within 10 days thereafter.

The motion stood over until the trial of the action.

L.C.C. Tramcar Accident—Damages.

In the King's Bench Division last week, before Mr. Justice Pickford and a common jury, Mrs. Julia Wilby, widow, and Mrs. Mary Heffern, both of Westminster, secured damages against the L.C.C. for injuries received owing to a tramcar colliding with the vehicle in which the ladies were riding whilst crossing Leman Street, Whitechapel, in July of last year. The collision threw both ladies out on to the road, seriously injuring them. The jury awarded damages to Mrs. Wilby to the amount of £550, and £100 to Mrs. Heffern.

J. H. Austin & Co. *v.* Gloucester Corporation.

At the Bristol County Court recently, plaintiffs, a firm of electricians of Bristol, claimed £30 from defendants for various decorative features supplied when the late King Edward visited Gloucester last year. For plaintiffs it was stated that Mr. Winter visited Gloucester, and at the electrical engineer's request quoted for various decorative devices, the prices being confirmed by telephone. The materials were supplied and used, and subsequently plaintiff received a cheque for £7 10s. in settlement. This was altogether inadequate. In his evidence Mr. Winter said that he suggested sending up a number of decorative appliances for exhibition so that other customers might be obtained, and also to make Gloucester "look up," and the engineer agreed. There was no suggestion whatever that the warehousing of those goods at the Gloucester electrical depôt should form part payment for his contract.

According to the report of the case in the *Western Daily Press*, plaintiff, in cross-examination, denied that if the things were sent it was understood it would be on the distinct understanding that the Corporation were under no obligation to use them. He consigned to the Corporation works a large number of devices which were not used by the Corporation, and those devices were stored at their works. Some of the devices he sent to the works were hired by tradesmen in Gloucester from him. It was not arranged that some of the things should be fixed and used for the purpose of attracting customers. He denied that the Corporation agreed to pay for such articles as they used, the price to be left to the engineer to fix, having regard to the facilities which he was given. Definite prices were agreed upon as stated in his claim. No work was mentioned as to the cost of repairs to some of the devices, and no complaint was made as to the need for repairs.

Mr. F. H. Corson, chief electrical engineer to the Corporation of Gloucester, gave evidence for the defendants. Dealing with the initial interviews, witness said he sanctioned a large quantity of material being sent to Gloucester, but it was on the distinct understanding that he gave no undertaking it should be used. It was arranged also that the devices should be fitted up at the electrical works, and illuminated so that people might see them with a view to hiring them. The goods were forwarded, and were stored at the works. They occupied 36 yards of space. They were not in good repair when they arrived, and witness had them put right. He had frequently spoken to Mr. Winter about the defective state of the apparatus, and had told him they would have to consider the work of repairing and overhauling in any payment they made. Some of the articles repaired at the Corporation works were used by private individuals or firms.

Mr. J. B. Feltham, chief assistant electrical engineer to the Gloucester Corporation, and Mr. L. C. Mitchell, electrical engineer, also gave evidence against the claim. The latter said that Mr. Winter's charges were unreasonable.

Mr. Wethered addressed the judge, and contended that from beginning to end no prices were agreed upon, but the remuneration was left to Mr. Corson.

Mr. Melcalfe urged that the charges were most reasonable and that Mr. Winter was not a philanthropist.

His Honour said he hoped that no one would consider from his judgment that Mr. Corson had done anything which was either unworthy or deserved censure. He was at the time in a very difficult position. His Honour gave a verdict on the claim for £22, and a counterclaim set up by the defendants for repairs to and warehousing Mr. Winter's goods, was dismissed. Plaintiff was allowed costs.

Attorney-General *v.* Leicester Corporation.

This action, which raised the question whether a municipal corporation having statutory powers for the supply of electricity had also power to supply fittings, &c., on the premises of the consumer, was opened before Mr. Justice Neville in the Chancery Division on Monday last.

Mr. Felix Cassel, K.C., and Mr. Dinequer represented the plaintiff, and Mr. Danckwerts, K.C., and Mr. McCardie appeared for the defendant Corporation.

Mr. Cassel, in opening the case, said that the Attorney-General was suing at the relation of Mr. Utley, a ratepayer of Leicester, and the action was brought to obtain a declaration that the defendants were not entitled to carry on what he should compendiously call the business of electrical contractors. Plaintiff also claimed a declaration that the defendants could not expend their funds for that purpose, and an injunction to restrain them from so doing, and consequential relief. Defendants were a Municipal Corporation under the Municipal Corporation Act, 1882, and they obtained in 1890 a provisional order under the terms of the Electric Lighting Act of 1882, that being confirmed by a special Act by which the Corporation were authorised to supply electrical energy within the area of their borough. Defendants did not obtain any express power to enable them to supply fittings or stoves, motors or machinery of that kind. But the contention, and the point really for trial, was whether there was any such express power on the other part of the undertaking which the Corporation was authorised to carry on as being incidental to that undertaking. There was also the defence raised, that apart from the statutory powers, the Corporation being a Corporation at common law, had powers apart from the statute. But even if it were so, he (counsel) did not think that would very materially affect the plaintiff's case if the defendants had the power at common law—which he submitted they had not. With regard to the acts complained of, there was an issue of fact and also an issue of law to be tried. Plaintiff's case was that the defendants carried on nothing more nor less than an electrical contractor's business. What the plaintiff said the defendants were doing was this: In 1894 they started certain showrooms in one of the streets of Leicester, and there they had offered for sale every kind of appliance in connection with the use of electricity—fittings, cooking apparatus, radiators, vibrators, apparatus for heating shaving water, hair dryers, &c. If this was legitimate at all, it would extend to all the infinite varieties of apparatus for which electricity might be used. His contention would be that the undertaking which the defendants were authorised to carry on was the supply of electrical energy, and that they were expressly debarred from going beyond the business of supply and entering on the business of supplying fittings, wirings, materials, &c., used in the consumption of electricity. He submitted that the defendants' powers stopped when they had supplied the electricity on the premises of the consumer. As soon as the consumer turned on the switch the defendants' powers ceased. He contended that the defendants had power to do anything which was incidental to the business of supply, such as the purchase of coal, putting up a generating station, and so on, but that power must be limited to that which was incidental. He contended that the supply of such things as he had mentioned was clearly outside the powers of the Corporation. Such a business, counsel submitted, was not authorised to be carried on by a municipal Corporation unless there were some words in the Statute that would clearly justify it. Up to a certain point they had admissions from the defendants—admissions which, he submitted, were enough for his purpose, but he should call evidence which would carry the case far beyond the admissions. His contention was that the whole of the things mentioned in the statement of claim were illegal and *ultra vires*. The plaintiff said, and proposed to prove by evidence, that the defendants were supplying these things not only to customers to whom they supplied electricity or electrical energy, but also to persons who took no energy from them at all. He should show that at the showrooms the defendants supplied lamps and other things to anyone who chose to walk in and ask for them. He should prove one case of a man who was not a resident of the borough who walked in and asked for a lamp and bought one. Another thing he especially complained of was the supply of bells. They generated their own electricity, and did not take the electricity supplied by the Corporation at all. Those, in any case, could not be said to be incidental to the supply in the sense that the defendants claimed. Another instance was where they installed a dynamo for a gentleman who wished to generate his own electricity. That, again, could not be incidental to a supply of electrical energy. Another cause of complaint was that the defendants were carrying on this business at a substantial loss. No doubt their accounts showed a profit, but that was only arrived at by not debiting against the undertaking rent, depreciation, &c. Counsel did not wish to disguise for one moment that the relator was a competitor in business, but his submission was that the Corporation had not got the power to set up such a competing business, and use the rates for the purpose of carrying it on, rates which were paid by the very people they were competing with.

The case was one of very great importance to the ratepayers, because if they could carry on this business without any statutory power they might start municipal bakeries, municipal workshops, and he was not sure that it would not extend so far as to their being engaged in transactions on the Stock Exchange. If he was right in his proposition the Corporation had no right to do any fitting, and in that case their admissions would be sufficient for his case, but the evidence he should call would go very far beyond that. In addition to the admissions in the defence, they had an express admission made on April 19th last, that the Corporation had a department for the supply of all electrical fittings. There was a decision of a County Court Judge, which was, of course, not binding upon that Court, but which went to show that what the defendants were doing was *ultra vires* of a Corporation.

Mr. Danckwerts submitted that counsel was not entitled to read such a decision as an authority.

Mr. Justice Neville thought Mr. Danckwerts was right.

Mr. Cassel agreed, and said he would adopt that decision as part of his argument. Referring to the Electric Lighting Act of 1882, counsel said that it was rather remarkable that it was called an Electric Lighting Act, because it was an Act authorising not only electric lighting, but also the supply of energy for all purposes. Under that Act there were two methods by which licence to supply could be obtained. One was by licence under provisional order, and the other by Special Act. In the present case they need only deal with licence under Special Act.

Mr. Justice Neville said that it appeared to him that there were two questions before the Court. First of all, could the Corporation do these things; and, secondly, if they could, could they pay for them?

Mr. Cassel said that was so, so far as exercising any powers under the Act was concerned, but it seemed that the defendants raised something beyond. Supposing that apart from any statute the defendants had a general right to carry on business, then he (counsel) contended that they could only throw on the local rate the expenses incurred under the Act, and they had no power to pay for anything that was not authorised by the Act.

Mr Danckwerts said his learned friend might take it that he was not going to rely upon anything that was outside the statutes.

Mr. Cassel said that considerably relieved him. He submitted that "necessary" and "incidental," as used in the Act, meant necessary and incidental to the supply of electric current. He relied on the absence in this Act of any such provision as was found in the Gas Works Clauses Act of 1871. Sec. 38 of that Act contained a right to supply fittings that were the property of the consumer, but here the fittings and meters were the property of the supplier. In the Electric Lighting Acts a clear distinction was drawn between the user and supplier. The Electric Lighting Act contained words that clearly showed that if the fittings of the consumer were of such a character that the electricity was being wasted, that supplier could refuse a supply, but could not go on the premises of the consumer and control the fittings. They had no control over the fittings on the premises of the user, and the statute did not give them power to put in their own fittings. He was not going to draw any distinction between electricity and electrical energy as used in the statute, but he had an electrical expert whom he would call as a witness if necessary, who would give evidence on the point. The expression power meant electrical power, and the words "convenient" and "advantageous" found in the Act, he was not concerned with, as his contention was that the only thing that the Coporation could do were things incidental to the supply. He desired to call attention to the entirely different nature of the business the defendants were carrying on to that of supply. It was a question of *quasi monopoly*, and this business was competitive with the very ratepayers of the borough who were finding the money for carrying it on.

Evidence was called to prove the supply of lamps, shades, bells, &c., to persons both inside and outside the Corporation's area of supply, and the hearing was adjourned.

The hearing was continued on Tuesday and Wednesday—the proceedings will be reported here next week. His Lordship intimated that he would consider his decision.

The Rural District Council of St. Thomas, Devon, *v.* Siemens Bros. & Co., Ltd.

At Devonshire Assizes at Exeter on Monday, before Mr. Justice Ridley and a special jury, this case was heard. It was an action for damage to roads due to extraordinary traffic.

Mr. Simon, K.C., M.P., and Mr. J. R. Randolph were for the plaintiffs, instructed by Mr. A. E. Ward; Mr. J. A. Foote, K.C., and Mr. Ricketts were for the defendants, instructed by Messrs. Budd, Johnson & Jecks.

Mr. Simon said the defendants, who were large contractors of Woolwich, entered into a contract with the Post Office to provide telegraph wires in connection with a line recently laid through the counties of Devon and Somerset. These wires weighed 22 lb. to the yard, and they were coiled around great drums, each coil weighing about 2½ tons. Part of the business of the defendants was to deliver these coils of telegraph wire at different points in order that they might be put into tubes underground for the purpose of making the connections. The contract of the defendants with the Post Office amounted to £31,215, and the Rural District Council claimed £1,621 in respect of extraordinary traffic, and also of heavy weights. The amount of the claim represented the extra amount which the Council had incurred as a direct result of the wear of the roads caused by the traffic carried on by the defendants.

His Lordship thought it might be necessary to refer to a surveyor the question of the amount of damage, if there had been damage.

Counsel agreed that the question of liability should be the main factor in the case, and that if it became necessary to adjust the amount of the claim, it should be referred to an expert.

Mr. Simon went on to explain that three roads in the St. Thomas area were affected by this heavy traffic. The coils were brought by water into Topsham Quay, unloaded into trucks, and taken by heavy traction engines along the three roads, not only for the purpose of serving these districts, but in order to take these wires to distant jointing holes in different parts of Devon. Each of these trucks contained five tons, and some even higher weight, and these trucks, sometimes one, sometimes two and sometimes three, were taken behind the traction engine. It was these ponderous trains which had damaged the roads. A claim had also been made by Tiverton Urban District Council, but they had not suffered quite so much as St. Thomas Council, which had to submit to transport along their roads to distant points. This strain was put upon the roads in the winter, day after day, and week after week until they became quite ploughed up. Some work was done by the plaintiffs to put the roads right at the time, but the main expenditure for repairs was incurred after the defendants had completed their transport, which took six or seven months.

Evidence in support of the claim was given by Mr. S. Ingram, one of the county surveyors, and Mr. Bright, formerly assistant surveyor to the St. Thomas Council, whose evidence was taken on commission, and who had now gone to Australia. Mr. Bray, surveyor to the St. Thomas Council, was not called owing to an increasing infirmity of deafness. The witness as to weights of traction engines and trucks was Mr. T. J. Edwards.

This was the case for the plaintiffs.

Mr. A. H. Stapley, on behalf of the cable department of the defendants, said his firm never gave any orders to the sub-contractors (Messrs. Burden, of Poole), who received their instructions from the Post Office.

Mr. Foote, for the defendants, addressed himself to the two points. Was there excessive weight or extraordinary traffic? and whether this traffic was conducted as a consequence of the orders given by the defendants? As to the weight, this did not exceed the limit laid down by the by-laws of the County Council, and it would be for the jury to say whether an average of one journey a day for 105 days was extraordinary traffic. The defendants ordered their sub-contractor to deliver the wire, assuming that the work would be done properly. The action lay not against Messrs. Siemens, but against the carriers. If this claim were acknowledged, it would deprive the defendants of all the profits on their contract and expose them to a heavy loss.

His Lordship thought the jury would say that it was in consequence of the defendants' contract that this work was done. As to extraordinary traffic, his Lordship pointed out that no evidence had been called for the defendants, and, therefore, the case rested upon the evidence of the surveyors called by the plaintiffs. He thought there had been excessive weight and extraordinary traffic.

The jury, after 10 minutes' consultation in private, found for the plaintiff Council. The amount to which the plaintiffs were entitled was referred to arbitration.

A similar action against the same defendants by the Tiverton Rural District Council ended in judgment on the same terms.

"Z" Electric Lamp Manufacturing Co., Ltd., *v.* Marples, Leach & Co.

This case was down for hearing in the Court of Appeal before Lords Justices Farwell and Kennedy on Saturday last, upon the application of the defendants, for leave to adduce further evidence on the hearing of the appeal from a judgment of Mr. Justice Parker, upon the claim of the plaintiffs for an injunction to restrain the alleged infringement of Patent No. 21,654 of 1906, which was granted to one Johnson, and related to improvements in the manufacture of filaments for incandescent electric lamps, the alleged invention consisting of adding to the filament a substance called phospham, which was a mixture of phosphorus, nitrogen and hydrogen, the result being, it was said, to remove the carbon, and so prevent blackening. Mr. Justice Parker held that the defendants had infringed the patent, and granted the relief claimed.

Mr. T. Terrell, K.C., on behalf of the defendants, now said that he and Mr. A. J. Walter, K.C., for the plaintiffs, had agreed that their Lordships should make no order upon the motion that day, but that it should stand over until the hearing of the appeal, when their Lordships would be in a position to know whether further evidence should be heard or not. Their Lordships granted the application.

Donnersmarckhütte Oberschlesische Eisen und Kohlenwerke A.G. *v.* Electric Construction Co., Ltd.

In the Court of Appeal, before Lord Justices Farwell and Kennedy, on Saturday, Mr. A. J. Walter, K.C., moved on behalf of the plaintiffs, who are appealing to the Court of Appeal from a decision of Mr. Justice Parker, that the notice of appeal which was delivered on May 31st last might be declared a proper notice of appeal. In the alternative plaintiffs asked that if the notice of appeal was held to be bad the time might be extended. He said that the plaintiffs brought the action for infringement of patent, the case being tried before Mr. Justice Parker in January and February last, the learned Judge delivering a considered judgment on February 28th last that the patent had been infringed, but that the patent was wanting in subject matter. The order was finally drawn up on March 30th.

Lord Justice Farwell said that he saw the notice of appeal was only two days' out of time in any court, and asked Mr. Bousfield, K.C., for the defendants, whether he opposed the application.

Mr. Bousfield said he did. He saw no reason to anticipate that the judgment of Mr. Justice Parker would be reversed.

Lord Justice Farwell said that the Court would extend the time as asked, the costs of the motion to be costs in the appeal.

Compensation Case.

At Blackburn County Court on Monday a case was mentioned in which Mr. Thos. Barton, electrician, of Ainsworth Street, was respondent. He undertook to repair the tall chimney attached to Greenbank Ironworks, and in the course of the work, the steeplejack, Chas. Dewhurst, of Preston, fell owing to a breaking of the rope, and was instantly killed. His labourer, Jos. Sunderland, was injured.

Judge Hamilton agreed to the payment of £195 and costs to Dewhurst's dependant—a child of two—and he awarded 11s. 6d. per week compensation to Sunderland.

NEW ELECTRICAL DEVICES, FITTINGS, AND PLANT.

Kelvin Combined S.R. Ammeter and Voltmeter.

Messrs. Kelvin and James White, Ltd., of 18, Cambridge Street, Glasgow, have introduced a convenient pattern of combined D.C. ammeter and voltmeter, which is here illustrated together with a standard shunt. The instrument consists of a very sensitive milli-voltmeter fitted in a polished wood box, with plugs, switches, shunts, &c., to enable a large range of measurements to be made with facility. The scale has 150 divisions, and is provided with a mirror below the pointer. The moving coil is connected with a D.P. switch, for changing from amperes to volts, and six sockets are provided, with a plug connected to one of the voltmeter terminals, enabling the volt range to be varied from 0—1·5 to 0—600 volts, the total range being from 0·001 volt to 600 volts. Four shunts are supplied, covering a range from 0·01 to 750 amperes; all these are fitted into the case except the 750-ampere shunt, which is carried in a separate case as shown. The shunt terminals are of a patented pattern designed to clamp any size of cable with the minimum of trouble.

Besides measuring current and pressure, the instrument can also be used for carrying out low-resistance tests by comparison with one of the shunts, or by the ratio of potential difference to current, and for insulation resistance measurements, by direct deflection; the range of resistance measurements thus obtained, with a maximum pressure of 600 volts, is from 0·65 microhm to 3·3 megohms.

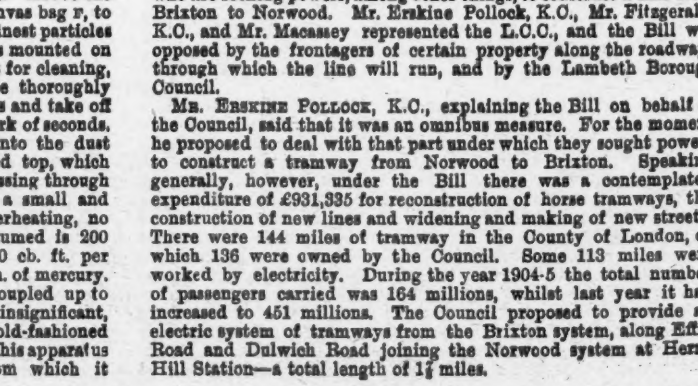


Fig. 1.—Kelvin Combined S.R. Ammeter and Voltmeter.

The "Santo" Vacuum Cleaner.

A very neat and simple electrical vacuum cleaner is being introduced by Mr. Duncan Watson, of 62, Berners Street, W., under the name given above. As shown in the accompanying illustration, fig. 2, the apparatus is constructed in a compact cylindrical form, mounted on easy-running ball-bearing castors, and as it weighs only 50 lb., it is very readily handled and moved about. The section, fig. 3, shows the arrangement of the mechanism, which presents several novel features.

The vacuum pump is driven by a small motor through a pair of eccentrics O, fitted with ball bearings P, with lubricating pads between the balls, and the moving parts are carried on a spring suspension which reduces vibration to a minimum; the spring suspension is not shown in the drawing, being a recent improvement. Above the pump is the double air filter, which consists of a canvas bag F, to catch the bulk of the dust, and a felt bag G, to stop the finest particles which may pass through the former; each of these is mounted on an aluminium ring, and can be removed in a moment for cleaning, while when the cover is in place the joints are made thoroughly air-tight with rubber gaskets. To unscrew the fly-nuts and take off the top cover, or the whole of the outer case, is the work of seconds. The dust-laden air enters at the top, and passes into the dust chamber by way of a conical hopper D with a glazed top, which enables the user to see the dust pouring in. After passing through the filter, the air is used to cool the motor, so that a small and light motor is enabled to do the work without overheating, no matter how long it is kept running. The power consumed is 200 watts, and the air displaced is calculated to be 25 to 30 cb. ft. per minute, the maximum vacuum produced being 7 to 8 in. of mercury. The consumption being so small, the cleaner can be coupled up to any ordinary lampholder, and the cost of running it is insignificant, while the advantages of its use, as compared with the old-fashioned methods of "cleaning," are enormous. We have seen this apparatus at work on an apparently perfectly clean rug, from which it extracted a surprising quantity of fine dust; it also picked up shavings, matches, cigarette ends and suchlike trifles with the greatest facility. Further, the escaping air is brought out through a nozzle at the bottom of the cleaner, and can be used to blow the dust out of crevices otherwise perfectly inaccessible, at the same time as the other end of the cleaner is being used for sucking up the dust, two flexible tubes and a variety of nozzles, brushes, &c., being provided, with a long hollow handle, which can be lengthened with extension tubes to any extent for cleaning high walls, &c. The working parts are entirely enclosed by the cover I, and as no starting resistance is required, the working of the apparatus is perfectly simple.

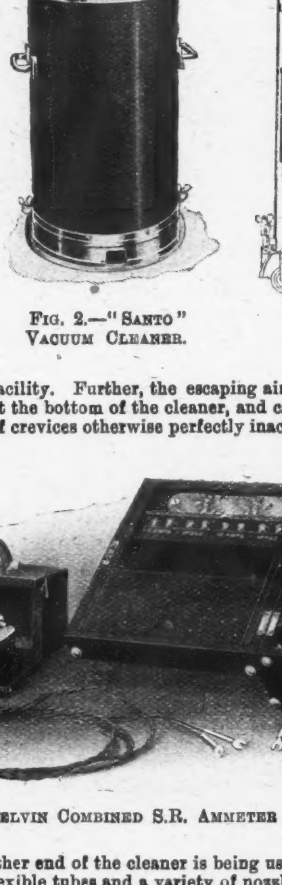


Fig. 2.—"Santo" Vacuum Cleaner.

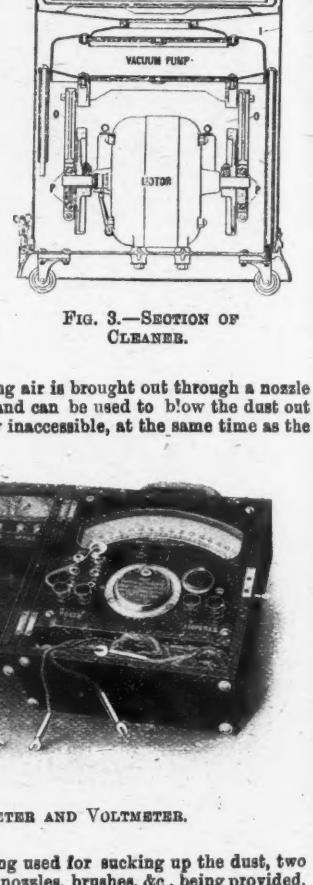


Fig. 3.—Section of Cleaner.

PARLIAMENTARY.

London County Council Tramways.

On Thursday last week the Select Committee of the House of Commons, of which Mr. Soames is Chairman, commenced the consideration of the Bill promoted by the London County Council who are seeking powers, among other things, to construct a line from Brixton to Norwood. Mr. Erskine Pollock, K.C., Mr. Fitzgerald, K.C., and Mr. Macassey represented the L.C.C., and the Bill was opposed by the frontagers of certain property along the roadways through which the line will run, and by the Lambeth Borough Council.

Mr. Erskine Pollock, K.C., explaining the Bill on behalf of the Council, said that it was an omnibus measure. For the moment he proposed to deal with that part under which they sought powers to construct a tramway from Norwood to Brixton. Speaking generally, however, under the Bill there was a contemplated expenditure of £931,335 for reconstruction of horse tramways, the construction of new lines and widening and making of new streets. There were 144 miles of tramway in the County of London, of which 136 were owned by the Council. Some 113 miles were worked by electricity. During the year 1904-5 the total number of passengers carried was 164 millions, whilst last year it had increased to 451 millions. The Council proposed to provide an electric system of tramways from the Brixton system, along Effra Road and Dulwich Road joining the Norwood system at Herne Hill Station—a total length of 1¾ miles.

Mr. Maurice FitzMaurice, engineer to the Council, said that the cost of the Norwood-Brixton proposal would be about £28,000. The line would be constructed on the overhead system.

Mr. E. White, Chairman of the Highways Committee of the L.C.C., gave evidence corroborating Mr. Bullock's opening statement, in the course of which he stated that the proposed route was at the suggestion of the Lambeth Borough Council.

Mr. A. Young, valuer to the L.C.C., said that, if the Home Office objection prevailed and the 9½ ft. width between the kerb and the rail was insisted upon, it would mean an additional outlay of £108,000. To meet all the police suggestions, there would probably be an additional expenditure of between £200,000 and £300,000.

Mr. A. L. C. Fell, the tramway manager, also gave evidence.

Mr. Maurice FitzMaurice, chief engineer, recalled, said that the Lambeth Borough Council wanted them (the Council) to widen the road at Brockwell Park by taking a strip of the park, and to set back the lodge and entrance gates. The total cost of purchasing the necessary land and effecting the scheme would be £6,800, and the County Council would have to bear the whole of the expenditure. In his opinion, this widening was not necessary.

Mr. E. Harper, statistical officer to the L.C.C., said that the proposal to run down Effra Road was better than going through Water Lane. There was considerable congestion of traffic at the corner of Water Lane, and, for that reason, he did not think that route was an advisable one—the one put before the Committee now was the best.

(To be continued.)

Second and Third Readings.—In the House of Commons, on June 8th, Farnham Gas and Electricity Bill was read a third time. The following Bills were read a second time:—Metropolitan District Railway, Metropolitan Railway, Reading and District Electric Supply, and Wimbledon and Sutton Railway Bill.

BUSINESS NOTES.

Superheating.—Engineers and managers sometimes hesitate to install superheaters on account of the structural alterations necessary to their boiler setting, and the time required to shut down; but it is possible to reduce the stoppage to a minimum. During the past few weeks Mr. John Thompson, of Wolverhampton, under the supervision of Mr. A. L. Tester, his London representative, has installed two of his bent-tube superheaters at the chemical works of Messrs. Forbes, Abbott & Lennard, East Greenwich. These were for a 30 ft. × 9 ft. 3 in. dish-end Lancashire boiler and an ordinary 30 ft. × 7 ft. flat-end boiler. The contract included the erection of steam pipes giving a by-pass connecting to their existing mains, and all necessary alterations to the down-takes. These were fairly extensive, including shifting the dampers raising the side flues of the larger boiler two courses of bricks, and rebuilding the back flues for a width equal to the two boilers. Steam was shut down on Friday evening, and the boilers handed over on the following Wednesday morning at 6 a.m. with full steam up and the superheaters at work, giving 110° F. and 100° F. of superheat respectively. To save time the contractors had all their materials on the site before stopping, then cleared away the whole of the down-takes and back flue, erecting the piping and superheaters in position, and finishing the brickwork when everything was in place.

France.—La Société des Ateliers de Constructions Electriques du Nord et de l'Est, of Jeumont, has taken up the manufacture of underground electric cables suitable for a pressure of 40,000 volts.

Meter Approved.—The Board of Trade signifies by notice in the *London Gazette* its approval of the Aron D.C. watt-hour motor-meter, type W.M., deposited in November, 1908, by the Aron Electricity Meter, Ltd.

Fire.—According to an Edinburgh paper, extensive damage was caused at Rosyth Dockyard, on the 11th inst., in the afternoon. "Fire was discovered to have broken out in the electric power station, situated a little to the west of Rosyth Castle. The erection is of wood, with a corrugated iron roof. The place appears to be wrecked. The loss of machinery, which cannot be readily replaced, will cause great inconvenience and delay to the work, as until there is another installation, work can only be carried on during the day."

The dynamos at the Rosyth Naval Base contractors' power station have been sent to Birmingham to be overhauled. If not possible to repair them, after the serious damage by fire, new ones are to be at once constructed. All the electrical equipment in the station will require to be replaced, and the National Gas Engine Co.'s men have the gas engines in hand. As regards the cause of the fire, the only conjecture is that oil had been ignited on a small portion of woodwork. The value of the engines and dynamos, which developed 1,000 H.P., and the suction gas plant, all new a month ago, is placed at £20,000.

Russian Trade Opportunities.—A recent German Consular report refers to the increasing demand in Saratoff for electrical material and accessories of all kinds, especially in view of the desire on the part of the inhabitants for the installation of electric light in their residences. Practically the whole of this class of material at present comes from Berlin. There is a steady demand, too, in the district for motor vehicles; this trade, however, offers still brighter prospects in Samara.—*The Board of Trade Journal.*

Holiday Literature.—From the Health Resorts Association, 26, John Street, Bedford Row, W.C., we have received a number of holiday booklets published by them for a number of town councils—Ardrossan, Berwick-on-Tweed, Crieff, Elgin, Perth, Pitlochry, St. Andrews and Stirling. All contain a number of photographic half-tone views, and matter which will be found both interesting and useful to those who are on the look out for this year's holiday resort. Any of the booklets can be obtained by applying to the respective town clerks.

Catalogues and Lists.—Messrs. E.M.F., Ltd., 10, Ironmonger Lane, Cheapside, E.C.—New 12-page catalogue (V) describing and giving illustrations and prices of their electric fans and small-power motors for continuous and alternating current, and for all positions. Ceiling, porthole, box blade and desk fans, also automatic shutters and speed regulators, are among them.

British Thomson-Houston Co., Ltd., Rugby.—Folding price leaflet, describing briefly the B.T.-H. car-resistances and starting rheostats for C.C. motors; also a new price list (No. 244) of "Mazda" lamps; No. 238 list gives discount terms for quantities.

Messrs. Donovan & Co., Barwick Street, Birmingham.—Eight-page fully-illustrated list, giving brief particulars and prices of electric bell material, including ironclad bells, weatherproof bells, pushes and contacts, switches, cells, wall telephones, and bell and telephone line material.

Messrs. H. Tinsley & Co., Stanley House, Eldon Park, South Norwood.—Illustrated leaflet No. 21 describing the Drysdale patent A.C. potentiometer.

Mr. G. Braulik, 8, Lambeth Hill, E.C.—Leaflet No. 120, showing and pricing small electric fans and small power motors.

Messrs. Crompton & Co., Ltd., Salisbury House, London Wall, E.C.—Eight-page pamphlet (U22) describing their electrical instruments in 4-in. diameter cases for small switchboards, starter panels, X-ray, galvanic, and dental appliances.

Correction.—The two price sheets, Nos. 518 and 526, relating to telephone instruments and condensers, mentioned in our last issue, were received from Messrs. Siemens Bros. & Co., Ltd., not Siemens Brothers Dynamo Works, Ltd.

Messrs. Baxendale & Co., Miller Street, Manchester.—Price list of travelling requisites, suitable for the approaching holidays.

Messrs. Alfred Herbert, Ltd., Coventry.—Section C4 catalogue describing a 28-in. disk grinder just introduced by the firm.

Mr. George Ellison, Victoria Works, Warstone Lane, Birmingham.—Illustrated price sheet No. 180 describing faceplate type "Star-Delta" starters, totally enclosed, for three-phase squirrel-cage motors.

Bankruptcy Proceedings.—John Filmer Davie, electrician, late of 7, Great Castle Street, Oxford Street, W.—A sitting of the London Bankruptcy Court was held on Wednesday, June 8th, before Mr. Registrar Giffard, for this public examination. The accounts filed by the debtor show one liability of £156, and assets, "life policy £12 10s.," exclusive of a bad book debt of £65, and two shares to which no value is attached. Replying to Mr. E. Leadam Hough, Senior Official Receiver, the debtor stated that he had been throughout in the employ of electrical engineering firms, and now was engaged as an outside canvasser by a firm, at a salary of £200 per annum. Between September, 1901, and April, 1909, he was in the employ of Messrs. Palmer & Co., electrical engineers, Great Castle Street, W., and his only liability, so far as he knew, was to the petitioning creditor, who claimed in respect of the lease of those premises. Witness had an option to go into partnership with Mr. Palmer, and as he had some connection of his own with people in the electrical trade, he agreed to his name being added to the name plate of Palmer & Co. on the entrance to the premises. He also joined in the agreement for the lease, his idea being to avoid expense of another agreement in the event of the option for partnership being exercised. Having examined the balance-sheets, he came to the conclusion that it was not desirable to become a partner. Mr. Palmer thereupon formed his business into a limited company, and witness was given a £1 share to qualify him as a director. He had no other interest in the business, nor did he take any share in the promotion of the company, and he resigned his directorship when he left the company's employ last August. The only other directorship witness had held, was in a small company formed by his brother-in-law, and that post he had also resigned. Asked how he proposed to meet the liability for the lease of the Great Castle Street premises if called upon to do so, the debtor replied that he never expected that any liability would fall upon him, and he certainly had no separate estate from which to meet it. Mr. Perkins appeared for the debtor, whose examination was concluded.

J. G. S. Cunnington, electrical engineer and contractor (Laing, Wharton & Cunnington), lately trading at 7, Great Newport Street, London.—First and final dividend, 4½d. in the £, payable at 28, King Street, Cheapside, E.C.

Robert Edward Joy (trading as the Bristol Electrical Co.), electrical engineer, 143, Cheltenham Road, Bristol.—This debtor attended at the Guildhall, Bristol, last week, for his adjourned

public examination before Mr. Registrar Wright, who ultimately ordered the case to be concluded.

J. A. F. Milton, electrician, Hungerford Road, Crewe.—First meeting, June 23rd, at Newcastle, Staffs.; public examination, July 22nd, at Crewe.

R. E. Walker, electrical engineer and cycle agent, Hereford.—First and final dividend, 5s. 9d. in the £, payable from June 25th, at 2, Offa Street, Hereford.

Samuel Walter Habt, company director, of Cintra, Herman Hill, Wanstead.—A sitting of the London Bankruptcy Court was held on Thursday last week, before Mr. Registrar Hope, for this public examination. The statement of affairs showed total liabilities £11,492 (unsecured, £3,663), and assets valued at £267. The examination was concluded.

Canada.—The Dominion Power and Transmission Co., of Hamilton, Ont., have plans under way for the erection of a car-building plant to manufacture cars and equipment for the local street railway and others.

It may be news to your English readers, says our Canadian correspondent, that a number of English capitalists have decided to construct a million-dollar ship-building plant, at Owen Sound, Ont., situated on Lake Huron.

Dissolutions and Liquidations.—Unity Motor Electrical and General Engineering Co., Ltd.—A meeting will be held on July 12th at 28, Baldwin Street, Bristol, to hear an account of the winding up from the liquidator, Mr. J. G. Taylor.

Messrs. Walter Osmond Rooper and John Cecil Grant McFerran, carrying on business as W. O. Rooper & Co., electrical and consulting engineers, at 26, Victoria Street, London, S.W., and at Stafford, have dissolved partnership as from May 31st, 1910. Mr. Rooper will attend to debts.

Trade Announcements.—Mr. F. W. Busch, of Lüdenscheid, announces that Mr. Albert Brauckmann no longer represents him, and that he has appointed Mr. E. C. Seear (late manager of Mr. Brauckmann's electrical department) as his sole agent for the United Kingdom. Letters for Mr. E. C. Seear should be addressed 16 and 17, Devonshire Square, London, E.C.

Mr. Ernest W. Gunns, electrical engineer, 37, Oxford Road, Lowestoft, has taken over the electrical stock and premises of Messrs. Francis & Smith, Tonning Street, Lowestoft.

Messrs. Nichols & Co., electricians, have opened business premises at Bank Buildings, High Street, Barnes, Surrey.

The Oxford Electric Co., Ltd., has removed to new premises at 2, St. Michael's Mansions, Ship Street, Oxford.

Book Notices.—"Transactions of the North-East Coast Institution of Engineers and Shipbuilders." May, 1910. Vol. XXVI. Parts 5, 6 and 7. London and Newcastle-upon-Tyne: Andrew Reid & Co.

"*Transactions* of the South African Institute of Electrical Engineers." Vol. I, Parts 4 and 5. Johannesburg: The Institute. Price 2s. each part.

"*Proceedings* of the American Institute of Electrical Engineers." Vol. XXIX, No. 6. June, 1910. New York: The Institute. Price $1.

"*Bulletin* Scientifique de l'Association des Elèves des Ecoles Spéciales." April, 1910. Liége: *Imprimerie Moderne.*

"*Catalogue* of Mathematical and Scientific Instruments at Brussels Exhibition (British Section)." 1910. London: Eyre and Spottiswoode, Ltd.

"The Telegraphic Transmission of Photographs." By T. Thorne Baker. 1910. London: Constable & Co., Ltd. Price 2s. 6d. net.

"Power Required to Drive Rolling Mills." By J. Puppé. 1910. London: Charles Griffin & Co., Ltd. Price 12s. 6d. net.

"*Journal* of the Franklin Institute." Vol. CLXIX, No. 6. June, 1910. Philadelphia: The Institute. Price 50 c.

"The Technical Index." Vol. XVI, No. 3. June, 1910. London: M. J. Fitzpatrick. Price 1s.

"Fire Tests with Fire Extinguishers." *Red Books* of the British Fire Prevention Committee. No. 152. 1910. London: The Office of the Committee. Price 2s. 6d.

"Science Abstracts." Vol. 13, Part 5. Sections A and B. 1910. London: E. and F. N. Spon, Ltd. Price 1s. 6d. net.

LIGHTING and POWER NOTES.

Accrington.—Haslingden Corporation has discussed with Accrington T.C. terms for the supply of electric current to the former borough on a seven years' agreement. The total consumption per year was estimated by Haslingden to be 100,000 units, two-thirds of which would be for power purposes during factory hours, and one-third for lighting, with a maximum demand at one time of about 50 kw. The terms were not disclosed.

Acton.—Our Acton correspondent writes: "By 12 votes to 10 the Council last Friday at midnight arrived at the decision to negotiate with the Metropolitan Electric Supply Co., Ltd., to arrange the best terms upon which to hand over the Council's electricity undertaking to that company. This decision, not altogether unexpected, has been made possible by the returns at the recent election, when a Council of 24 members succeeded the old representation of 16, the majority of which had strenuously set their backs to such a proposal, repeatedly made by the present chairman, Mr. H. S. Schultess-Young, who is also at the head of the Ratepayers' Association. For over four hours the subject was debated on Friday night, prior to which members of the Council were put fully in possession of every phase of the question. It was contended that the undertaking had been a continuous burden on the rates, and that during the five years' working by the Council deficits had been created amounting to many thousands of pounds. Further, that the charges for electricity were such as prevented the local authority from fairly competing with gas. On the other hand, it was shown that during the past year the concern had made a substantial profit, and was now on its way to prosperity; that the growth of consumers was regular, and the Council was building up a valuable business. A short time since the Metropolitan Electric Supply Co., Ltd., offered to take over the undertaking for a period of 37 years, agreeing to pay all loan instalments and interest, and to hand back the concern in good order at the end of that period, the Council then to reimburse the company with a percentage of the cost incurred by laying new mains, &c., in extending the business. What their offer will be in the present stage remains to be seen. It is very evident that the majority of the Council intend to put an end to the present agreement at all cost."

The electrical engineer on Monday evening submitted a report to the Council with reference to the proposed supply of electricity to Messrs. Napier & Son, motor manufacturers, and other large business establishments in Acton Vale. Sometime ago Messrs. Napier informed the Council that they were prepared to taken one million units per annum. Five various schemes were submitted by the electrical engineer, the lowest figure to be £7,813 and the highest £13,386. Mr. Schultess-Young said that a special committee was appointed to consider the application of Messrs. Napier and Son, but as they had refused to guarantee for more than a two years' contract, he moved that no negotiations be entered into with them until their refusal to enter into a contract for more than two years be withdrawn. Mr. S. Digby Scammell seconded the resolution, which was adopted.

Alkham.—Providing sufficient consumers are obtained to meet the capital charges on a sum of £250, the Dover T.C. has decided to extend the mains to the parish of Alkham.

Ayr.—For some time past the T.C. has been discussing a proposed extension of the electricity works to permit of the area of supply including Prestwick and Alloway, and the engineer estimated the cost of the extension to Prestwick alone at £5,000. The result of a canvass having been unfavourable, the Council has decided to proceed no further in the matter.

Beckenham.—The Electricity Committee, dealing with the matter of tenders for free wiring, have given the following extracts from a report by their engineer, Mr. Tapper, on the subject:—"Having regard, however, to the fact that our free wiring capital may not last through the 12 months of advertised contract, it does not seem either fair or reasonable to expect an outside firm to open a branch at a considerable expenditure in the district, and it, therefore, seems advisable to consider the two following alternatives: (*a*) To extend the old contract with the existing contractors until the money is exhausted, or come to more favourable terms with them as to price; (*b*) the Council to carry out the work for the time being by engaging casual workmen." The Committee recommend the adjournment of the proposal to do the work themselves. They further recommend that application be made to the L.G.B. for a loan of £5,000 for further free wiring, and that the firms who have submitted tenders be told that the Council is unable to come to a conclusion on them until a further loan be sanctioned.

Bedford.—The B.G. has decided to install power plant at the workhouse laundry.

Birkenhead.—The T.C. has reduced the price of current for power and heating to 1½d. per unit for the first 1,500 units per quarter, and to 1d. per unit beyond.

Bradford.—The Electricity Committee has recommended the T.C. to make a substantial reduction in lighting charges, more especially for private houses.

Bundoran.—The electric lighting of this growing watering place is being carried out by Messrs. Myles & Co. It is possible that the scheme will be extended to the Great Northern Railway hotel and station.

Canada.—Ottawa.—Our correspondent writes: The Montreal Light, Heat and Power Co., through General Manager Norris, expressed a desire to be relieved from the service of lighting the streets. The company also gave notice that it would terminate the present arrangement on October 31st, and declared that it would rent its pole lines to the city were a municipal service decided on. The Board of Control came to the conclusion that the company were "bluffing," and decided to call for tenders for street lighting.

The town of Medicine Hat, Man., has decided on the installation of a municipal electric light and power plant, at a cost of $75,000. These Western towns are nothing if not up to date.

A few days ago the British Columbia Electric Railway Co. entered into a contract with the Point Grey City Council whereby they will supply it with electric light for 10 years. Four hundred lamps will be installed.

The big power companies at Niagara Falls are not having it all sunshine between them. The trouble arises from the method of payment

for power generated in excess of the amount stated in the agreement with the companies, the companies wishing to pay by the average load, the Queen Victoria Niagara Falls Park Commissioners desiring to receive pay as per peak load. By November 1st, 1909, the C.N.P. Co. were owing, by the average load method, some $56,765, but by the peak load they would be owing $83,101. The Ontario Power Co.'s figures were $10,323 and $23,717, and the Electric Division Co.'s up to August 1st, 1909, were $8,157 and $39,875.

Cape Town.—Our correspondent writes: The Corporation has now decided to establish assisted wiring in connection with its electric light system. The proposals are as follows: "Upon receipt of an application from householders, requesting the installation of electric light and to be advised as to the monthly instalments required to repay the cost of the same, tenders to be invited through local wiring contractors for undertaking the installation, and the lowest satisfactory tender having been selected, the applicant is advised of the cost and the amount of the monthly instalments. Before, however, the contract for the installation is completed, the householder is required to pay 10 per cent. of the total cost, and where the householder is not also the owner, payment of the total amount to be guaranteed. Further, to encourage canvassing by local wiring contractors, applicants to have the option of selecting their own contractor, provided the specification is submitted to and approved of by the city electrical engineer." The Corporation also proposes to add to the contractor's price for interest, supervision, &c., 5 per cent. where the cost of the installation is under £25, and paid for, 10 per cent. on signing contract and the balance in 12 monthly instalments; and 10 per cent. where the installation costs £25 or over, and payment is desired to be defrayed in not more than 24 monthly instalments. Where the applicant is not also the owner, payment of the instalments to be guaranteed by the landlord or other responsible guarantor.

Carlisle.—The T.C. has intimated to the R.D.C. that it intends applying for a prov. order for E.L. in the parishes of Kingmoor, Stanwix, Wetheral, St. Cuthbert's Without, Cummersdale, Belle Vue, and Grinsdale.

Coventry.—A L.G.B. inquiry was held on 8th inst., before Mr. H. R. Hooper, M.Inst.C.E., with respect to an application by the Council for a loan of £54,200, for the purposes of the electric light undertaking. It was explained that owing to the increased demand, estimated at 500 KW. per annum for the next five years, it was necessary to have additional plant, mains, transformers and sub-station equipment. The present earning capacity of the plant was 3,300 KW, with 600 KW. reserve, and the scheme provided for an ultimate earning capacity of 6,100 KW., with correspondingly adequate reserve provision. It was proposed to carry out the extensions in two sections, one immediately and the other in 12 months' time. The town clerk pointed out that the undertaking had recently been very successful, and had paid for a large amount of replaced machinery out of the profits, the profit last year being £10,070. The City Council, having regard to the success of the undertaking, desired to provide energy at a reasonably low figure, and proposed to reduce its charge of 1¾d. for the first 2,500 units per quarter to 1½d., and for consumers who took 50,000 units a flat-rate of 1d. for the whole supply. It was also proposed to supply private consumers with energy for domestic purposes, other than lighting, at 1d. per unit. The inspector agreed that additional generating plant was necessary, but he called attention to various unexpended balances of previous loans, which he suggested should be utilised for reducing the amount of loan now applied for. One of these items he found had been carried forward for 13 years, and there appeared no reason why it should not go on for 113 years. He reduced the total application to £28,108, and advised that the total unexpected balances of loans, amounting to £25,816, in respect to which sanctions had been given, should be used up. He instructed that the first portion of the scheme might be gone on with, and a further report presented to the L.G.B. Dealing with the question of revenue account charges, upon which his opinion was invited, he said that although the ratepayers might be fretful because various items, such as replacement of superseded machinery, were charged against this revenue instead of against capital, yet unless the capital expenditure were kept down, with the corresponding heavy charges for interest, it was impossible to supply energy at anything like a rate that would be commercially useful. He knew there were many undertakings showing as much as 1½d. per unit sold for capital charges alone. He considered the Coventry undertaking had very good prospects, and paid a high compliment to the cleanliness and equipment of the station.

Devonport.—The T.C. has reduced the price of current for lighting to 3¾d. per unit, and for power and heating to 1¾d. as from October 1st next.

Dowlais.—The Board of Trade has consented to the proposal of the Merthyr T.C. to light the town by electricity by means of overhead wires on condition that they be not placed in any street which is less than 22 ft. wide. The Board, however, reserved the right to review the situation at any time.

Dudley.—Last week Councillor Hughes, chairman of the Electrical Committee, stated that last year the gross profits were £5,824, and this year £5,272; last year there was a net profit of £123; this year there is a net loss of £606. This he attributed to the increase in the capital outlay, which was only £325 in 1909, whereas this year this item rose to £6,108, and next year it might possibly be £6,229.

Dundee.—For the electric lighting of the new part of the Corporation baths the offer of Mr. Mackenzie, at £130, has been accepted.

Durban.—A South African paper reports that negotiations have been proceeding between the Government and the Durban Corporation relative to the latter taking over the Farmers' Electric Power Station, and that there is every possibility of an agreement being arrived at.

Ealing.—The electrical engineer has been empowered to give a free supply of energy to any of the local tradesmen who require same for exhibiting electrical fittings and appliances at the Suburban Home Exhibition in Walpole Hall in September.

East Ham.—The Wanstead U.D.C. has written stating that it cannot see its way to give permission to the East Ham Council to supply electricity under Sec. 6 of the Electric Lighting Act, 1909, to premises belonging to the West Ham Guardians situate within Wanstead District. The Town Clerk of East Ham is to take the necessary steps to obtain the consent of the Board of Trade to a supply of energy being given to the premises named.

Edinburgh.—The Niddrie & Benhar Coal Co., near Edinburgh, are installing additional electrical plant at their Newcraighall Colliery, which will utilise the exhaust steam from the engines on the surface, and will supply further power required for pumping, haulage, and other purposes underground.

Finchley.—The annual report of the electricity undertaking for the year ended March 31st last shows a gross income of £17,575, and a total working expenses of £9,159. Deducting interest and sinking fund, there remains a balance of £377 to be carried forward. In the six years, £24,429 of money borrowed had been repaid. Mr. Syrett said that the revenue showed an increase of 15 per cent, the same rate as in the previous year. On the other hand, the expenditure was equal to 50 per cent. of the revenue, as against 55 per cent. last year, and 57 per cent. the year before. On the gross capital of £107,000, the gross revenue £8,883 worked out at 8 per cent. Commencing in 1905, they have spent in repairs and maintenance £3,094. The cost of production was a little higher than the average, but the electrical engineer, who had the success of the undertaking at heart, would watch that point very carefully. Mr. Rabbidge said that a private company would have supplied them with electricity at the price the Committee were charging, and the Council would have run no risk. They were told that the profit was £8,000 gross, but as a matter of fact, £4,400 of that was really as much a charge on generation as was coal. He referred to depreciation through wear and tear of machinery, and no private business would produce a balance-sheet without allowing for that. They were paying more for street lighting than if it was put up for public tender. After some further discussion, the report was adopted.

Frome.—The U.D.C. has decided by 10 votes to 4 to transfer the E.L. undertaking to Edmundsons, Ltd., who have run the works.

Gillingham.—The T.C. has decided to apply to the L.G.B. for sanction to a loan of £3,500 for prospective expenditure on mains and services.

Hendon.—Kingsbury Council is to be informed that at the expiration of the contract with the Gas Light and Coke Co. in September next, Hendon Council will exclude from the new contract 27 lamps, which the Kingsbury Council desire should be lighted by electricity; further, that Hendon Council is prepared to enter into an arrangement for the lighting of these lamps by electricity at the rate of £3 per lamp per annum.

Hereford.—On Friday a L.G.B. inquiry was held into the application of the T.C. for a loan of £3,000 for E.L. purposes, equal amounts being needed for mains and services.

Honley (Yorks.).—The U.D.C. has decided that the consideration of the supply of current to Thurstonland shall be allowed to lapse for the present.

King's Lynn.—Last week the Electricity Committee presented its accounts for the year ended March 31st, showing a profit of £838, as compared with £443 last year. 457,661 units were sold at an average of 3·04d., as compared with 523,563 units at 2·67d. last year. The total works cost was 1·315d., as compared with 1·215d. Last year's profit was carried to a surplus fund. About £200 of this year's profit will be used in reducing the charge for street lighting during the coming year, £200 will be carried to the meters account, the remaining £400 being carried forward.

At a meeting of the T.C. on June 8th reference was made to the department carrying on the E.L. fittings work. It was stated that the department was not carried on at a loss, and that it did not injure the private trader. Mr. C. W. Smith, who opposed municipal trading, asked what was the turnover on the fittings; in reply he was told that it was £1,219, and that it showed a good profit.

Lancaster.—The past year's working of the electricity department shows a net balance on revenue account of £83, against £711 last year and £1,078 for the year 1907-8. Since 1904 there has been £2,151 put to the reserve fund, £1,200 has been contributed to the rates, and £500 to stock redemption. The sale of electricity amounted to £8,321, against £8,676; public lighting, £786 (same); sale and repairs of lamps, £516. The chief items in the expenditure were:—Generation of electricity £2,530, against £2,671; distribution and management £3,023, against £2,297;

rent, rates and taxes £513, against £472; debt redemption £1,626, against £1,573; interest on mortgages £1,092, against £1,154; contribution to stock dividends account £626, against £645. The reserve fund now stands at £6,387, and the capital expenditure is £63,252.

Leith.—Messrs. Preece & Cardew are to be asked to decide as to the extension of plant for the electricity station. The point is whether to install a turbine with cooling tower or to provide a reciprocating engine. The burgh electrical engineer states that a 600-KW. N.C. reciprocating engine can be purchased for about £3,000, while a 500-KW. M.P. turbine, with the necessary condensing plant, will cost £6,000. The sub committee recommended the immediate installation of a 500-KW. mixed-pressure turbine, cooling tower, &c., which would be partly driven by the exhaust steam from the existing reciprocating engines, which at present is discharged into the atmosphere. There would be a saving over a reciprocating engine of about £224 per annum. The burgh electrical engineer considers that the requirements of the department would be met by a reciprocating engine, the behaviour of which they knew from experience could be relied upon. Should Messrs. Preece & Cardew approve of neither of the proposals, they are to state what they recommend.

London.—POPLAR.—The electrical engineer reports a breakdown of Nos. 1 and 2 turbo-alternators due to the presence of a nail which pierced the mica tube and destroyed the insulation between turns of No. 1 alternator, causing a short circuit, this throwing an exceedingly heavy overload on No. 2 alternator and resulting in the burning out of the stators of both machines. The Committee is not at present able to discover how the nail got there, but it is pursuing investigations into the matter. The Committee has under consideration the desirability of the provision of a spare stator and rotor of the latest type for use in case of any future emergency. The total cost of the present repairs will not exceed £500.

FULHAM.—The Electricity Committee recommends that alterations to sub-stations be made at a cost of £824 to meet the requirements of the regulations under the Factory and Workshop Act, to increase the capacity of certain of these sub-stations, and generally to render them more efficient and up-to-date. £430 of this amount represents the cost of new transformers and switchgear.

MARYLEBONE.—The General Purposes Committee report having considered an estimate from the electricity department for the maintenance of the Town Hall electrical installation, the Committee has decided to have the work done on the basis of cost price plus 10 per cent. for supervision. The Public Health Committee has accepted an estimate of £50 from the electricity department for re-wiring and overhauling the electric light installations at four conveniences, and also for re-wiring and overhauling the installation at the Mortuary. The Electricity Committee reports that from statistics which have recently been taken out (and which will be completed for the whole of the borough as soon as possible), of the first 2,000 premises (taken in consecutive order, not in any way picked, but representing all classes of property), less than 40 per cent. are actual consumers; it will, therefore, be seen that if this percentage is accurate for the remaining premises in the borough, a very large field is still open for purposes of the development of the undertaking.

Market Harborough.—The U.D.C. is applying to the B. of T. for an extension of time for carrying out the E.L. order, which expires on June 22nd. As the result of a canvass only 39 prospective consumers have been secured, with a total of about 500 lamps, but it is assumed that at first a supply for 1,000 lamps would be needed.

Melbourne.—The E.L. and Power Co. has submitted to the P.C. a scheme for undertaking the entire lighting of the parish on a five years' agreement.

Netherton.—Electrical power is to be installed at the Marine Chain Works.

Newport (Fife).—A proposed extension by the Tayside Electric and Gas Light Committee is occupying the attention of the T.C. The Council, it seems, is not prepared to approve of any extension of lines above ground, but is willing to consider favourably an extension of distributing mains underground.

Newport (Mon.).—Mr. H. R. Hooper held an inquiry last week into the application of the Corporation for leave to borrow £31,255 for the purposes of its electrical undertaking. The Town Clerk said that the Committee came to the conclusion that the plant must be increased before next Christmas, otherwise the Corporation would fail to fulfil its obligations. Mr. C. P. Sparks recommended, among other things, the installation of new plant and a centralisation of the generating power of the present power station in Corporation Road. The loan would be required (1) for machinery and accessories for the power station in Corporation Road; (2) new machinery at Llanarth Street; and (3) new cables from Corporation Road to Llanarth Street, cables to distribute current from Llanarth Street to various parts of the town, and the supply of sub-station plant to reduce the voltage. Mr. H. Collings Bishop, the electrical engineer, said it was their ultimate intention to make the Llanarth Street works a central sub-station. The Corporation had an inquiry for 1,400 H.P. from one customer. Last year the works showed a loss of £1,469, but during the year now closing there would be a credit balance of £376 owing to the increasing applications for power. The Inspector said it appeared fairly obvious that this application was the first instalment of considerable further expenditure with no stand-by plant at all. The turbine was only in its infancy at present, and might break down. Mr. Bishop did not anticipate any further expenditure in less than 12 months. The Ratepayers' Association and the Newport Gas Co. opposed the application, contending that the town had lost heavily by adopting electricity in place of gas for street lighting. The inquiry was adjourned until Saturday, when Mr. Horaby said the Ratepayers' Association did not desire to resist any necessary expenditure, but they were very anxious to test the details of the further expenditure upon an undertaking which had already consumed a large amount of capital. One of the points he wished to emphasise was that cables or distributors had been laid in streets where there was only one person proposing to become a small consumer, and then on top of that, street lighting had been installed, and nothing had been charged for sinking fund against public lighting. Replying to the Inspector, Mr. Bishop gave an undertaking not to lay distributors in new streets, unless there was good reason to believe that the expenditure would be productive. The Inspector said that it was very necessary to be careful about the expenditure, for it was obvious that the undertaking was already very much over-capitalised.

North Berwick.—Some time ago the Corporation decided that it was not averse to a company coming into the town for the purpose of providing electricity if a friendly agreement was arrived at. The T.C. has now discussed the terms of Messrs. Crompton & Co. for giving a supply, and an agreement will subsequently come before it for adjustment. The Council will have the option of purchasing the property at the end of 12 years.

Rochdale.—A L.G.B. inquiry was held on 8th inst. regarding the proposed Corporation loan of £13,941 for extensions at the electricity works. It was explained that the loan was made up as follows:—Battery rooms and stores, £2,835; stack foundations, £355; accumulators, £2,990; booster, switchgear and cables, £1,360; transformers (already spent), £73; prospective expenditure, £4.0; mains, £3,713; house services, £751; meters, £445; water treatment plant and pipe work, £605. The units sold in 1904 were 840,530; in 1910 they were 3,545,339; private consumers, 172 and 505 respectively, and capital expenditure, £53,768 in 1904 as compared with £97,318 now, and capital outstanding after repayment of sinking fund charges was £48,375 in 1904, and £75,612 in 1910. Substantial sums had been paid from profits in relief of the rates. The average price obtained per unit of energy sold for all purposes was now 1·46d. against 1·5d. in 1907. The charge for energy for tramway traction was on a sliding scale; last year it worked out at 1·12d., and that price had obtained for three years. The present plant was almost loaded up to its full capacity, and the main intention of the accumulators was for traction purposes. The inspector pointed out that only five years would be allowed for the repayment of the loan for meters.

Runcorn.—The B. of T. has received from the promoters of the Urban and Rural E.L. Order, a letter objecting to the request of the R.D.C. to have the area of supply extended in Frodsham, on the ground of expense. The B. of T. has informed the R.D.C. that it does not propose to make any amendment in the order in regard to the compulsory area.

St. Annes.—The number of electricity consumers has increased during the year from 793 to 913. There is an increase in the supply for lighting, industrial and domestic power purposes, but a considerable falling-off in the supply to the tramway company.

A L.G.B. inquiry was held on June 9th regarding the proposed borrowing of £3,000 for electricity works extensions. The Council asked for the loan to be repayable in 30 years. The proposed work included a new chimney, 160 ft. high, and an economiser. The contract for the erection of the chimney was £1,988, and the economiser would cost £400. Since the installation nine years ago, the units sold for private lighting had increased from 30,060 to 247,173; for public lighting, from 68,147 to 91,906; for power and heat, from 162 to 48,985; and the total number from 98,369 to 802,734. In 1904 the Council first supplied electricity to Blackpool and Lytham Tramways Co. for traction, and last year the company took 414,670 units. The price for the latter was revised every five years. There was a revision of rates in 1909, which accounted for a reduction in the profits. The reserve fund now stood at £4,547.

St. Helens.—Mr. H. A. Reed, M.Inst.C.E., on behalf of the L.G.B., held an inquiry on June 9th, relative to the T.C.'s application for sanction to borrow £10,230 for electricity extensions. Mr. Hollingsworth (borough electrical engineer) stated that the works must be extended to keep pace with the demand. £6,300 was required for one turbo-alternator, with condensers and switchgear, at the power station (Cropper's Hill), and for switchgear and transformers in two of the sub-stations in the Sutton district.

Through the breaking of an overhead electric tramway wire the cable installation in the subway under Church Street, St. Helens, took fire about midnight on Monday last week, causing an extraordinary spectacle. Electric and gas supplies had to be cut off, and the fire brigade fought the flames under circumstances of great difficulty. The Post Office telegraph cable in the subway was destroyed. According to the *Liverpool Daily Post*, the fire melted off a leaden gas-pipe connection, liberating the gas, which intensified the flames. Several of the electricity supply mains were burned, as well as the telephone wires. The incident emphasises one of the risks attendant upon the use of subways for gas, water and electric mains in common, which have been com-

mented on in our columns. Fortunately, on the recommendation of the electrical engineer, Mr. Hollingsworth, a special fireproof room was recently built, in which the switchgear was housed, thus saving it from injury.

Stockton-on-Tees.—Further extensions of the cables are to be made to reach a large power consumer whose demand may fully load up the available machinery at the works, and lead to a further reduction in the cost of production on account of the increased output of the plant.

Stretford.—It was reported at a meeting of the U.D.C. this week that the L.G.B. Inspector had given his award on the subject of providing power for the tramway to the United Football Ground in favour of the Manchester Corporation, and directed that the cost of the inquiry should be paid by the Stretford Council. Mr Whiteside, in accepting the decision on behalf of the Council, regretted that the award had been given against them, but said that so far as Stretford was concerned the decision would be loyally carried out.

Mains are to be extended upon the application of Mr. H. M. Emery to supply current to 140 houses and some shops off Chester Road and Warwick Road, Old Trafford.

Swansea.—The E.L. Committee reports that in about six months' time Messrs. Vivian & Sons, who now take a supply from the Corporation to the extent of about £1,680 per annum, will cease to be a customer, inasmuch as they are laying down their own plant.

Walkden.—Mr. R. Littler, county architect, has been instructed to prepare a scheme for the electric lighting of the technical school that is being built at Walkden.

Walsall.—The Corporation having had several applications for electricity in the Birchells district, the Electricity Committee is considering a scheme for extending the mains along Green Lane, Birchells, and for applying to the L.G.B. for a loan.

Warrington.—A L.G.B. inquiry was held on 8th inst. respecting the T.C.'s proposed borrowing of £7,400 for extending the electricity works to meet increased demand. Opposition was raised by two ratepayers, who contended that further borrowing powers were unnecessary, and who maintained that the Corporation was borrowing to supply electricity at less than cost. Last year, they alleged, 1,750,000 units were sold for power at a loss. The borough treasurer said that the overdraft at the bank was £20,055. The inquiry closed.

West Bromwich.—A new feeder is to be laid in the town at a cost of £4,000.

West Ham.—Draft agreements with Messrs. J. Knight, Ltd., and the Anglo-Continental Guano Co. for bulk supplies of energy to their respective premises at Silvertown have been approved. Terms have been arranged with Messrs. Savill Bros., Ltd., for a supply to Taplow's Bottling Stores at Leytonstone Road, and with the New Oil Refining Process, Ltd., for a supply to their premises at Silvertown.

Whitwood.—The U.D.C. has sealed an agreement for E.L. with the Yorkshire Electric Power Co. At the latter's request the agreement has not been made public, but has been regarded as a confidential document.

Yarmouth.—The electricity accounts show a gross trading profit of £9,087. Special works of a permanent character, and depreciation on works for which no sinking fund is established, absorbed £948, leaving £8,139 available for interest and capital charges, as compared with £7,597 in the previous year. The net balance, after making every provision for capital charges, interest, rebates and depreciation, was £880. It was decided to transfer £600 to the general reserve fund.

TRAMWAY and RAILWAY NOTES.

Argentina.—The *Boletin Oficial* of May 10th contains a decree approving the contract and plans submitted by Messrs. Otto Franke & Co. relative to the construction in Buenos Ayres of an underground electric railway, which will run from the border of the Riachuelo to the Retiro station, and to the Plaza Constitucion, thence joining the lines at the Buenos Ayres and La Plata harbours.—*Board of Trade Journal.*

Blyth.—At a meeting of the Urban Council at Blyth on the 9th inst., the proposal to link Blyth up with the tramway system at Whitley and Tynemouth was again considered, when it was decided to invite the Whitley and Monkseaton Council to co-operate with the Blyth authority in promoting a tramway service between the two places, and also to ask for the co-operation of the local land-owners.

Bolton.—The Tramways Committee has now completed important improvements on the Daubhill and Four Lane Ends section, having laid double track as far as Hulton Lane. The laying of tramways to the Brownlow Fold district will be carried out shortly.

Bournemouth.—At a meeting of the T.C. on June 8th, the Tramways and Parliamentary Committee reported the receipt of a letter from Mr. F. T. Olding, traffic superintendent, resigning his position, he having obtained an appointment in Queensland. Mr. C. W. Hill, general manager, stated that he had selected for the appointment Mr. C. S. Baldwin, traffic superintendent of the Burton and Ashby Light Railways, and previously traffic manager of the Doncaster Tramways, and the appointment was confirmed.

The Tramways Committee, having fully considered the report of the general manager, together with a further verbal report on the condition of the conduit equipment, indicating the heavy expense for maintenance which would be necessary in the near future if the conduit system were retained, recommended that subject to the approval of the Board of Trade the present conduit system be abandoned, and overhead construction substituted, as suggested in the report. The proposal was opposed, but it was pointed out that under the present conditions, owing to having two separate systems, considerable delay frequently occurred.—Councillor Trowbridge supported the action of the Committee, as he considered there was no redeeming feature at all about the conduit system, which they were warned against at the start, and which had cost the town something like £50,000, money literally thrown away. It was agreed that the matter should be referred to the whole Council in Committee at a special meeting to be held on Wednesday last.

Buenos Ayres.—It was stated at the Berlin meeting of the German Transmarine Electricity Co., held on June 7th, that the construction of the underground tramways proposed by the Anglo-Argentine Tramways Co. in Buenos Ayres would be commenced next year, the expenditure being estimated at £5,000,000. The Transmarine Co., which supplies power for the working of the surface tramways, has already concluded contracts with the Anglo-Argentine Co. for furnishing the power for the operation of the underground lines, which will ensure a large load for the new plant that is being installed by the former company.

Burnley.—Several important extensions of the tramways have been passed by the General Purposes Committee, and the Council will be recommended to approve of them as follows:—Briercliffe Road, estimated cost, £4,250; overhead equipment, £760; bonding, £91—total, £5,101. Rosegrove, total, £1,321; Manchester Road, total, £1,305; additional rolling stock (two cars), £1,580—grand total, £9,307. A report on the scheme has been presented to the Tramways Committee by the borough engineer, electrical engineer and tramways manager, and passed.

Bury.—The annual report of the Corporation tramways shows that the gross traffic receipts amounted to £59,682, an increase of £752 over last year. The number of passengers carried on the Bury section was 7,894,786. There was a net surplus of £2,636; £2,500 has been carried to reserve and depreciation account and £135 to the borough rates. The car-mileage increased by £35,457, and the receipts were 9·64d., against 9·80d. per car-mile.

Chile.—H.M. Consul-General at Valparaiso reports that the Department of Public Works has arrived at the conclusion that it will be advantageous to substitute electric for steam traction on the first section of the Chilian State Railways, from Valparaiso to Santiago and Los Andes. H.M. Minister at Santiago reports that tenders have now been invited for this work, and will be received at the "Ministerio de Obras Publicas," Santiago, up to July 15th. —*Board of Trade Journal.*

Edinburgh.—The first electric tramway in the city was inaugurated on Wednesday last week, when a car conveying a number of officials was run from Ardmillan Terrace to the new cattle markets at Gorgie. The route is a mile and a-quarter in length.

Glasgow.—The sub-station at Hayburn Street, Partick, has been found too small, and the Committee now purposes erecting a more commodious station at New Bridge Street, the cost of the buildings alone being £7,000.

Heath Town.—The U.D.C. has decided to ask the Wolverhampton T.C. to lay tramways along Cannock Road to Fallings Park.

Northampton.—The balance-sheet of the Corporation tramways, presented to the T.C. on Monday, showed a net profit during the year ended March 31st last, of £4,185. The income from the tramways was £24,821, and from the omnibuses £884, a total of £25,705. The working of the cars cost £12,568, and of the omnibuses £1,375, a total of £14,033, so that the balance of income over working expenses was £11,672. Of this, £4,006 was spent in the repayment of mortgage loans, and £3,939 was expended in interest on capital. The profit of £4,185 was dealt with thus:—In aid of rates, £1,950; to reserve £1,200; carried forward for new cars, £1,035.

Japan.—The authorities of the Yokohama Electric Railway have secured the Government sanction to proceed with the construction of an electric railway between Nishinoashi and Honmoku-machi.

Lancaster.—The borough accountant's analysis shows that the net tramway loss to the ratepayers to date has been £23,010 (including the repayment of principal and interest). The traffic revenue last year was £4,992 against £4,839; the traffic expenses were £2,241 against £1,990; general expenses, £552; power, £1,825; repairs, £611; interest on loans, £1,531; debt redemption, £1,342; The number of passengers carried was 1,336,534 against 1,301,886. The cars ran 166,394 miles against 159,792 miles, and the receipts per car-mile were 7·20d. against 7·31d. for the previous 12 months. Capital expenditure amounted to £1,991, making the total up to date £43,330. The amount of debt extinguished through the sinking fund is £9,563, and the deficiency has been met by the borough rates, this being the only unprofitable undertaking of the Corporation, and due solely to its being an incomplete system, only serving a portion of the town.

Leeds.—The T.C. has applied to the B. of T. for an extension of time to August, 1912, for the completion of tramways in the city.

London.—L.C.C.—The Highways Committee has had under consideration the desirability of making arrangements whereby passengers on the Council's tramways may book direct to any station on the several underground electric railways in London and *vice versa*, and suggests that authority for the purpose should be sought in the Parliamentary Session of 1911.

Northampton.—The T.C. has decided to promote a Bill in the next session of Parliament, giving it power to extend the tramways to Far Cotton.

Nottingham.—The annual report of the Tramways Committee states that the receipts, not including interest on investments, amounted to £154,936, an average of 11·13d. per mile, being an increase of £3,552 over the previous year. The working expenses amounted to £98,163, an average of 7·06d. per mile, there being a decrease of £2,453. The balance, amounting to £56,773, has been disposed of as follows:—

Interest on stock and loans	£16,540
Sinking fund and repayment of loans ...	17,934
Reserve and renewals fund	1,748
In aid of general district rate	20,550

The reserve and renewals funds now amount to £62,257. The total number of passengers carried was 34,647,238, an increase of 833,241. The cars ran 3,306,322 miles, an increase of 13,664. The amount expended upon the maintenance of the undertaking was £15,902. The consumption of electrical energy was 5,412,218 units, equal to 1·63 units per car-mile. The year was again free from accidents of a serious nature. Five adult pedestrians and 12 children were picked up on the life-guards, all of whom escaped with very little more than a severe fright; five cyclists and five cycles were picked up on the life-guards practically uninjured.

Oldham.—In connection with the proposed extension of the tramway from Moorside to Grain's Bar, the estimated cost for the track work, without equipment, is £7,660, and the inclusive estimate £10,890.

Poole.—At a meeting of the Poole T.C. on June 7th, the town clerk reported that the Board of Trade had appointed an arbitrator to settle the matter in dispute between the Bournemouth Corporation and the Poole Corporation under the agreement relating to the tramways.

Thornton.—At a meeting of the Thornton (near Blackpool) District Council held on 9th inst., it was announced that a deputation from the Council would shortly interview the L.G.B., and upon that interview will depend whether a special rate should be laid to cover the law costs in connection with the recent tramroad rating appeal, or whether their Council and two others concerned should jointly bear the expense.

Turkey.—The Commercial Intelligence Branch of the Board of Trade, in connection with the concession for the construction and working in Constantinople and its suburbs of electric tramways, points out that prizes to the amount of £T1,000 (£900) are to be given by the Commission of Adjudication to the best projects submitted other than that of the successful tenderer. Tenders will be received by the "Ministère Impérial Ottoman des Travaux Publics," Constantinople, up to November 10th next.—*Board of Trade Journal.*

Whitworth.—The new length of electric tramways from Healey to Whitworth, near Rochdale, was officially inspected on Tuesday morning by Lieut.-Col. Druitt for the Board of Trade. The track was passed as satisfactory, and the line was opened for traffic.

Yarmouth.—At a meeting of the T.C. last week the Tramways Committee presented the balance-sheet and revenue account for the year ending March 31st last. The gross profit was £6,588, and bank interest £86. Interest and sinking fund required £6,606, leaving £68, which, with the balance from 1909, made £367 to be carried forward. The general renewal fund was £4,278, the third-party insurance fund £1,253, and the total sinking fund accumulations £13,666.

Ald. Arnold, who, since the electric tramway system has been introduced into the borough, has filled the office of chairman of the Committee, has resigned that position, and has been thanked for the valuable services he has rendered to the borough, the Deputy Mayor (Ald. C. A. Campling) being elected as his successor.

TELEGRAPH and TELEPHONE NOTES.

Argentina.—A new company has been formed in Colon, under the title of Red Telefonica del Norte, Ltda., to acquire the old telephone installation there, and to connect all the northern districts of Buenos Ayres and the southern districts of Santa Fe with Rosario, Buenos Ayres, &c.

London-Paris Telephone.—It is reported that the service between London and Paris last week was very unsatisfactory, and for a time interrupted, owing to the fact that the wreck of the *Pluviose* was resting on the submarine cable near Calais.

Pacific Cable and Canadian Landline.—Reuter announces that the directors of the Pacific Cable have leased a trans-Continental wire from the Canadian Pacific Railway Co., thus extending their system to Montreal, the terminus formerly being Vancouver Island.

Paraguay.—Mr. J. M. Meza Landaeta has obtained permission to construct a telephone line between Ortiz and Parapara.—*B. of T. Journal.*

Wireless Telegraphy.—CHILE.—The Government has asked Congress for an appropriation of $243,000 to install the wireless system between Santiago and Punto Arenas.

According to the *Daily Telegraph* of yesterday, the president and first vice-president of the United Wireless Telegraph Co. of America had been arrested by the United States Post Office inspectors on a charge of fraud on a large scale.

CONTRACTS OPEN and CLOSED.

OPEN.

Australia.—BRISBANE.—June 22nd. Deputy Postmaster-General. Copper wire, insulators, battery material, &c. Local representation. Deposits may be paid at the High Commissioner's Office, 72, Victoria Street, S.W.

MELBOURNE.—June 17th. Arc lamp carbons, for the City Council. See "Official Notices" May 27th.

June 21st. 35 miles of paper-insulated rubber-covered cables, for the Deputy P.M.G. Specifications from and deposits to Commonwealth Offices, 72, Victoria Street, S.W. Local representation.

July 1st. 36,000 incandescent lamps for the City Council. See "Official Notices" June 10th.

July 27th. Pneumatic tube service for the P.M.G.'s Department at Adelaide. See "Official Notices" to-day.

August 2nd. 1,820 private letter-box fronts for the P.M.G.'s Department in Victoria, Queensland, South Australia and Western Australia. See "Official Notices" to-day.

S. AUSTRALIA.—July 6th. Cordless switchboards for the P.M.G.'s Department in South Australia. See "Official Notices" May 20th.

VICTORIA.—July 19th. 4,200 Commonwealth telephone sets, for the P.M.G.'s Department in Victoria. See "Official Notices" May 27th.

Austria.—June 27th. The Austrian State Railway authorities in Vienna are inviting tenders for electric lighting and power plant at the railway works at Simmering.

Batley.—June 28th. Battery of accumulators, automatic reversible traction booster, and one battery charging booster, for the Corporation. See "Official Notices" June 10th.

Belfast.—June 22nd. Direct-coupled steam engine and dynamo, for the Harbour Commissioners. See "Official Notices" June 10th.

Belgium.—July 14th. La Direction du Service Special de l'Escaut Maritime (Marche-Ble-de-Zelande), Antwerp, is inviting tenders for the construction and erection at that port of an electrically-operated wagon lift. The full specification and plans can be obtained from 15, Rue des Augustins, Brussels, for 1 fr. 90 c.

July 20th.—Tenders are being invited by the Société Nationale des Chemins de Fer Vicinaux, of Brussels (14, Rue de la Science), for the supply and laying of the underground and sub-river electrical mains required for feeding the current to the local railways in the Bruges district. Particulars can be obtained from the address given at a cost of 1 fr.

Birmingham.—June 30th. General and engineering stores for the Corporation electric supply department.

Carlisle.—June 27th. Cast-iron piping and steel steam piping, for the City Electricity Department. See "Official Notices" to-day.

Clacton-on-Sea.—June 22nd. 440 yds. armoured twin 7/18 vulcanised bitumen service cable, for the U.D.C. See "Official Notices" June 10th.

Crompton.—June 30th. Dynamos and electrical equipment for lighting new and present buildings at the sewage works, with motors for driving machinery, standards, wiring, lamps, &c., complete, for the U.D.C. J. P. Wilkinson & Son, Civil Engineers, 30, Cathedral Street, Manchester. (Returnable deposit of £5 5s.)

Italy.—June 30th. The Ministry of Marine is inviting tenders from Italian and foreign firms for the supply of electric lamps and lampholders to the arsenals at Spezia, Naples, Venice and Taranto. The upset price is put at 150,000 lire (£6,000), and a deposit of 15,000 lire (£600) will be required to qualify tenders. Tenders to "Signor Direttore Generale dei Servizi Amministrativi e della Contabilità, Ministero della Marina," Rome. Tenderers will be required to furnish certificates of competency. Personal representation is practically necessary.—*Board of Trade Journal.*

Kingston-upon-Hull.—June 20th. Supplying and laying mains, for the Hull Corporation Electricity Committee. See "Official Notices" June 3rd.

Lancaster.—Tenders are invited by the Lancaster County Asylum Visiting Committee for electrical goods for 12 months ending July 3rd, 1911.

Leeds.—June 21st. Installation of Osram lamps with transformers, at the Workhouse and Infirmary, for the B.G. J. H. Ford, clerk, South Parade.

London.—L.C.C.—July 5th. 250 car bodies, 250 sets of centre bearing swing bolster trucks, and 250 overhead and trolley equipments. See "Official Notices" June 10th.

Hornsey.—The Education Committee has decided to invite tenders for the electric lighting of Stroud Green School.

Hammersmith.—June 22nd. Low-tension service cable and air-cooled transformer, for the Borough Electricity Department. See "Official Notices" to-day.

Manchester.—June 22nd. Meters, service cables, motors and motor-starters, for the Corporation. See "Official Notices" June 10th.

Morocco.—It is reported that tenders are to be invited for the installation of telephone and electric light services in different towns.

Newport (Mon.).—June 27th. Low-tension, high-tension and extra-high-tension switchboards, for the Electricity Committee. See "Official Notices" June 10th.

Pontypridd.—June 20th. Washed nuts for 12 months for the U.D.C. Electricity Works. Mr. J. E. Teasdel, engineer.

Rawtenstall.—July 1st. Tramway permanent way construction, steel poles, overhead equipment, cables, conduits, trenching, section boxes and accessories, for the Corporation. See "Official Notices" June 10th.

Shanghai.—July 5th. Two 940-K.V.A. two to three-phase step-up transformers, E.H.T. switchgear and E.H.T. underground mains and feeder pillars, for the Municipal Council. See "Official Notices" to-day.

Spain.—June 25th. The municipal authorities of San Feliu de Llobregat (province of Barcelona) are inviting tenders for the concession for the electric lighting of the town during a period of ten years. Tenders are to be sent to, and particulars may be obtained from, El Secretario del Ayuntamiento de San Feliu de Llobregat.

Stockport.—June 22nd. Materials for the Corporation electricity and tramway departments. R. Lomax, Tramways and Electrical Engineer, Millgate.

Swansea.—June 27th. Twelve months' supply and delivery of motors and starting switches for the Corporation. See "Official Notices" June 3rd.

Turkey.—October 28th. H.M. Consul at Constantinople (Mr. A. T. Waugh) reports that tenders are invited by the Turkish Ministry of Commerce and Public Works for a concession for the construction and working of electric tramways in the city of Constantinople and its suburbs. For further particulars see this column for June 3rd.

West Bromwich.—June 20th. Paper-insulated, lead-covered, feeder and pilot cables, for the Corporation Electricity Department. See "Official Notices" June 3rd.

West Ham.—June 20th. Electric light installation at three schools, for the Education Committee. See "Official Notices" May 27th.

CLOSED.

Ashton-under-Lyne.—The T.C. has entered into agreements with Messrs. Bruce Peebles & Co., Ltd., the Blasberg Engineering Co., and Messrs. W. H. Allen, Son & Co., Ltd., for the supply and erection of additional generating plant at the electricity works.

Australia.—According to the *Times*, the Western Australian Government have accepted tenders for 20,000 tons of rails and fishplates of British manufacture. The tender has been secured by a firm of merchants on behalf of the North-Eastern Steel Co., Middlesbrough. Lower foreign tenders were received, but the Government gave preference to British manufacture.

Belgium.—Nine firms—five German and one each Belgian, French, Austrian and British—last week submitted tenders to the Belgian Post and Telegraph authorities for the laying of the cables connected with an underground telephone system in Brussels and making good any roads that may be disturbed in carrying out the work. The lowest tender submitted was that of the Siemens and Halske Co., which quoted £4,835. The British firm which competed for the contract was the British Insulated and Helsby Cables, Ltd., of Prescot, which was eighth on the list with £6,386.

Blackpool.—The tender of the British Thomson-Houston Co., for high-tension switchgear at the new electricity sub-station at South Shore, has been accepted.

Bradford.—The T.C. has accepted the tender of Messrs. Thornton & Crebbin, Ltd., for iron castings for the tramway track equipment, at £299.

Clacton-on-Sea.—The U.D.C. has accepted the tender of Johnson & Phillips, Ltd., for service boxes, joint-box compound, cut-outs, and meter boards; and that of Engelbert & Co. for oils, for the electricity works.

Croydon.—The T.C. has accepted the tender of Messrs. Johnson & Phillips, Ltd., for installing the E.L., call bells, &c., at the hospital extensions, at £349.

Dundee.—The T.C. Works Committee recommends the acceptance of the offer by Mr. T. C. Keay for the electric lighting of St. Paul's (South) Parish Church, for £105.

Dublin.—At last week's meeting of the Corporation, Alderman Corrigan moved a report of the Technical Education Committee recommending the acceptance of the tender of Messrs. Fletcher and Phillipson, at £1,273, for the wiring and fitting for electric lighting of the Technical Schools, Bolton Street. The City Electrical Engineer reported that this firm had tendered for £300 worth less of cable than the other tenderers. He advised the Council to await a further report from him. As reported in the *Freeman's Journal*, Alderman Corrigan pressed the acceptance of the tender, as it was on a specification for the entire lighting of the schools which these contractors had signed, and the work must be done to the satisfaction of the City Electrical Engineer. The Chairman did not think, in face of the letter of Mr. Ruddle, they should pass the report. Mr. Briscoe said the Council would be acting unwisely if they did not accept the tender. He seconded the motion. The Town Clerk said it would be for Mr. Ruddle to see that the specifications drawn up by him were properly complied with. Alderman T. Kelly said the Council ought to support the report of the Committee. Mr. Ruddle ought to have reported to the Committee the information he now gave to the Council. The report was adopted.

The other tenders were:—

Johnson & Phillips	£1,434
Egan & Co.	1,487
Ampere Electrical Co.	1,775
Dockrell, Sons & Co., Ltd.	1,799
Dowdall & Sons	2,043
Cummins & Sons	2,138
Radiant Electrical Co.	2,250
Curtis & Sons	2,368

Eastbourne.—Tenders for a twelve months' supply of electricity meters were received by the Electricity Committee from the following firms:—

Electrical Co.
Siemens Bros. Dynamo Works Co., Ltd.
British Thomson-Houston Co.
Bat Meter Co., Ltd.
British Westinghouse Electric and Mfg Co., Ltd. (accepted).
Aron Electricity Meter, Ltd.
Ferranti, Ltd.

Edmonton.—The following tenders for plant in connection with the electric light and power installation of the Edmonton Union were accepted by the Guardians at their last week's meeting (Messrs. May & Hawes, consulting engineers):—

Specification No. 5.—For electric motors and accessories for laundry equipment.—G. Harland Bowden & Co., Manchester, £240, with E.C.C. motors.
Specification No. 6.—For electric-lift motors and fan.—R. Waygood & Co., Ltd., £293.

Faversham.—The T.C. has accepted the tender of Messrs. Semark, Ltd., for forced lubrication of the gas engine at the electricity works, at £90

Isle of Wight.—For laying cables and wiring at the new Joint Hospital at Fairlee, Newport (I. of W.), referred to in last week's ELECTRICAL REVIEW, the following tenders were received :—

Isle of Wight Electric Light Co.	(accepted)	£114
Ashton & Holt, Ryde		135
J. Bustin, Banbury		99
Johnson & Phillips, Ltd.		104
E. C. Guttrall, Ryde		107
E. Newbold & Co., Sutton		109
Shalders & Davis, Southampton		135

Llandudno.—The contract for replating the storage battery has been placed with the Chloride Electrical Storage Co., Ltd.

London.—POPLAR.—The B.C. has accepted the following tenders :—

Westminster Engineering Co.—Re-winding one stator and fixing new end supports, £170.
Bruce Peebles & Co.—Re-winding stator in solid copper, in place of flexible, re-assemble core, ventilate castings and fix new end supports, &c., £300.

Each amount is exclusive of erection.

STEPNEY.—The Crosthwaite Fire-Bar Syndicate, Ltd., is to fit its apparatus to three additional boilers at the electricity works, at £135 per boiler. "Fumicide" apparatus is to be installed to two more boilers by Mr. H. Bennett for £150.

L.C.C.—The Highways Committee recommends that three additional motor vehicles be provided, in order that the tramways department may be in a position to deal efficiently with breakdowns on tramway routes. They will be purchased from the British United Road Traction Co, Ltd., for £1,395.

WANDSWORTH.—The Board of Guardians has accepted the tender of Mr. H. J. Godfrey, of Balham, for the installation of electric light and ventilating exhaust fans at the infirmary, St. John's Hill, Clapham Junction.

Newport (Mon.).—The Electricity Committee of the T.C. has accepted the tender of the General Electric Co., Ltd., for a 60-KW. motor-generator, two 400-KW. generators, and a booster, at £3,047.

Plymouth.—The Tramways Committee of the T.C. has accepted the tender of Mr. J. W. Courtenay for the right of advertising on the tramcars, at £680 per annum for five years.

Poland.—A 4,000-H.P. electric power generating plant is about to be installed at the textile mills of Messrs K. Scheibler and Co., at Lodz, Poland. The Siemens-Schuckert Gesellschaft, of Berlin, have secured the contract for the electrical portion of the work, and the Gorlitzer Maschinenbau Gesellschaft, of Gorlitz, Germany, that for the steam plant.

Southampton.—The T.C. has accepted the following tenders :—

Hughes & Lankester, London.—500-gallon ejector, £382.
Electric Construction Co., Ltd.—Motor-alternator, £598.
Dick, Kerr & Co., Ltd.—Steam generator, with Cole, Marchant engine and surface condensing plant, £8,181.
Babcock & Wilcox, Ltd.—Water-tube boiler, £1,590.

Walsall.—The Corporation has accepted the tender of Messrs. J. & F. Wootton for erecting an electric sub-station in Darwall Street for the sum of £1,150.

West Bromwich.—The T.C. has accepted the tender of Messrs. C. A. Parsons & Co. for a 1,000-KW. turbo-generator and condenser.

West Ham.—The T.C. received the following tenders for additional plant for the generating station :—Water-tube boiler with superheater, stoker, &c. :—

Edwin Danks & Co.		£1,052
Clarke, Chapman & Co.		1,174
" " "	(alternative)	1,235
Babcock & Wilcox	(accepted)	1,575
Stirling Boiler Co.		1,650

Condensing plant.

Willans & Robinson, Ltd.		£2,900
Mirlees Watson, Ltd.		2,690
Willans & Robinson, Ltd.		2,300
Richardsons, Westgarth, Ltd.		2,200
Worthington Pump Co., Ltd.		2,114
British Westinghouse Co., Ltd.		2,050
" " "	(first alternative)	1,897
" " "	(second alternative) (accepted)	1,835
W. H. Allen, Son & Co., Ltd.		1,863

Whitehaven.—The T.C. has accepted the following tenders :—

Whipp & Bourne.—Main switchboard.
Stout & Son.—Pipework.
Vulcan Engineering Co.—Economiser.
Callender's Cable Co., Ltd.—Cable.
Vaughan & Co.—Boiler-house runway.

FORTHCOMING EVENTS.

National Electrical Manufacturers' Association.—Tuesday, June 21st. At 2.30 p.m. At Balfour House, Finsbury Pavement, E.C. Committee meeting.

Faraday Society.—Tuesday, June 21st. At 8 p.m. At the Chemical Society's Rooms. Papers on "Studies in the Electrometallurgy of Ferro-Alloys and Steel," by M. Paul Girod, and "The Failure of Light Engineering Alloys, particularly Aluminium Alloys," by Mr. E. F. Law; and exhibition of some new types of mercury-vapour lamps, by Dr. F. Mollwo Perkin.

Institution of Civil Engineers.—Wednesday, June 22nd. At 8 p.m. "James Forrest" lecture on "Recent Developments of Telegraphy and Telephony," by Sir J. Gavey.

Junior Institution of Engineers.—Saturday, June 25th. At 10.15 a.m. Visit to the works of the Thames Ironworks, Shipbuilding and Engineering Co., Canning Town, E.

THE ELECTRICAL ENGINEERS
(LONDON DIVISION).

THE following orders are announced :—

Commanding Officer—COL. R. E. B. CROMPTON, C.B.

Monday, June 20th.—"A" Company. Technical drill, 7 to 9.30 p.m. Rating examination for those who have been warned.

Tuesday, June 21st.—"B" Company. Recruits' infantry drill, 6.30 to 7.30 p.m.; technical drill, 7.30 to 9.30 p.m. Any N.C.O. or man who has not yet performed his qualifying drills is reminded that they should be performed before camp.

Wednesday, June 22nd.—Gymnasium, 6.30 to 9.30 p.m.

Thursday, June 23rd.—"C" Company. Examination for ratings for all N.C.O.'s and men who have been warned.

Friday, June 24th.—"D" Company. Examination for ratings for all N.C.O.'s and men who have been warned.

(Signed) P. H. CAMPBELL, Capt. R.E., Adjutant.
For O.C. E.E., L.D.

NOTES.

Canada.—A Canadian correspondent writes : "The rates of profit on hydro-electric enterprises have been gradually declining on this side of the water. The same is true to some extent of electric railways. As to the latter, it is more marked to the south in the United States. The electric railways of the big cities of Canada, as Montreal, Toronto, Ottawa and a few other towns, comprise one of the biggest paying dividends in the Dominion. But in the smaller towns this is not the case. Two things are indispensable to making an electric railway pay; these are, the people and the cash—in a word, the people with money in their pockets. Where there is no great business nor industrial activity, electric railways will not pay, no matter whether densely populated or not.

"There are several causes why these electric enterprises are not paying so well. First, increased operating costs due to increased cost of labour and material; increase in cost of rolling stock and machinery; bigger and better and increased competition and diversion of traffic.

"Electric railways in this country have reached a limit of economy in the management of their affairs consistent with safe and efficient operation. Employés are clamouring for increased wages, and the people for increased mileage rides for the usual nickel, and they are getting it. With the transfer system one can go from one end of a city to the other, often as much as 12 miles. The length of the ride for a nickel is increasing every year. The passenger to-day pays about one-fourth of what he paid 20 years ago.

"If the employés are to have increased wages, as they clamour for, and if we must have bigger and better cars and a quicker service, some measures of economy must be attempted forthwith. It is difficult to increase the fare above a nickel, but the abolishing of transfers and passes would increase the revenue, and this is about all that the companies can do. The outlook, therefore, for electric railway stock is not very bright. Neither is it for power enterprises. The development of power enterprises in Canada has gone too far for the population of the country and its manufacturing possibilities.

"The town of Renfrew has voted $117,000 to purchase and develop power in the Bonnechere River.

"Mr. C. Chamberlain, of the Great Falls Power Co, has offered to furnish power to the city of Portage La Prairie, Man., for a term of 30 years beginning January, 1912, and to take a minimum of 2,500 H.P. The proposition is to be accepted."

Institution and Lecture Notes.—A series of three lectures on "The Lighting of Interiors" is being given at the East London College (University of London), and on Wednesday last week Prof. J. P. Morris, M.I.E.E., opened with a lecture on "Principles, and Daylight Illumination." After discussing some of the incorrect methods of illumination caused by people's lack of knowledge on the subject, the lecturer proceeded to point out some very interesting facts in connection with daylight and its fluctuations. As an example, he exhibited a curve plotted from readings taken in the grounds of the East London College during the afternoon and evening of June 7th last. About 1.30 the intensity was about 3,500 candle feet, but when the sun was obscured for a short time the intensity of illumination fell off to one-third of its maximum value. At 6.30 the light had only $\frac{1}{200}$th of its value at 1.30, while by 9 p.m. the light was not much more than $\frac{1}{20000}$th of its mid-day intensity. On the grounds being lighted up with arc lamps the illumination only rose to 0·10 candle feet, from which the huge difference between daylight and artificial light can readily be seen.

Coming to the question of how much of this light passes through the windows of the average building, figures were quoted giving the ratio between inside illumination and outside illumination for several well-known buildings. It varies from about 0·002 to 0·008 on the desks of one of the latest elementary schools down to 0·0001 in the booking hall of Charing Cross Station. This ratio is found to remain fairly constant throughout the day. The contraction and expansion of the pupil of the eye in order to meet these fluctuations were explained and illustrated by experiments which have been carried out at the East London College. One person who, when looking away at an angle of 30° from a lamp having a candle-power of 0·05, had a pupil area of 50 sq. mm., had this latter area reduced to 2·9 sq. mm. on coming into the broad daylight.

The illumination measurements were carried out on a Trotter Universal Photometer, and the principles and working of this instrument were explained by the lecturer.

The next two lectures, on June 15th and 22nd respectively, deal with "Illumination by Gas and Electricity," by Prof. J. T. Morris, M.I.E.E., and "Illumination by Petrol Air-Gas," by Prof. C. A. M. Smith, B.Sc. The lectures are free, on application to the Registrar of the College.

Engineering and Scientific Association of Ireland.—The annual excursion in connection with this Association took place on Saturday last. Over 70 members and friends proceeded to Howth. Some members of the party visited the power house, Sutton, where they were received by Mr. A. W. Whieldon, M.I.E.E., chief electrician of the Great Northern Railway Co. They inspected the three Lancashire boilers and the three dynamos that generate power for the Hill of Howth tramways. The battery house, situated at the summit of the hill, was also inspected. The battery house, or sub station, is used for keeping the pressure steady and continuous, and for supplying the electric current for the late cars at night. The battery is composed of 255 Tudor cells worked with an E.C.C. booster.

Excursion.—The annnal excursion of the West of Scotland Iron and Steel Institute and the Glasgow Section of the Institution of Electrical Engineers—a joint event this year—took place on June 9th. A specially-chartered steamer, the *Duchess of Hamilton*, took the party, which numbered over 200 ladies and gentlemen, from Gourock through the Kyles of Bute and round Ailsa Craig.

Institution of Mining Electrical Engineers.—A visit will be paid to the Treforest power station, Upper Boat, Treforest, on 25th inst., at 3.30 p.m. (by kind permission of Mr. W. A. Chamen, M.I.E.E., general manager); the invitation is also extended to other branch members. All intending visitors should notify the local secretary, Mr. Geo. Humphrey, 113, Olive Road, Canton, Cardiff, by 22nd inst.

Junior Institution of Engineers.—At the last meeting of this Institution a paper entitled "Notes on the Running of an Electricity Works," by Mr. L. Marshall Jockel, was read and discussed. The paper was given by the author as winner of the Durham Bursary of 1908, in accordance with the conditions of the Bursary. The last visit of the Institution was to the *Daily Mail* printing office, Carmelite House, and was very largely attended; to-morrow there will be a visit to Letchworth for inspection of the Garden City.

The I.E.E. New Premises.—Mr. P. F. Rowell, the secretary, informs us that, from Thursday next, June 23rd, the address of the Institution will be: Victoria Embankment, London, W.C. The removal of the offices will commence on Monday next, June 20th.

Appointments Vacant.—Secretary in the Birmingham Corporation Electric Supply Department (£600); engineer for the Lincoln County Hospital (35s.). See our advertisement pages in this issue.

"Lamlok" Clip.—We are informed that this device, described in our last issue, is the invention of Mr. C. M. Bennett.

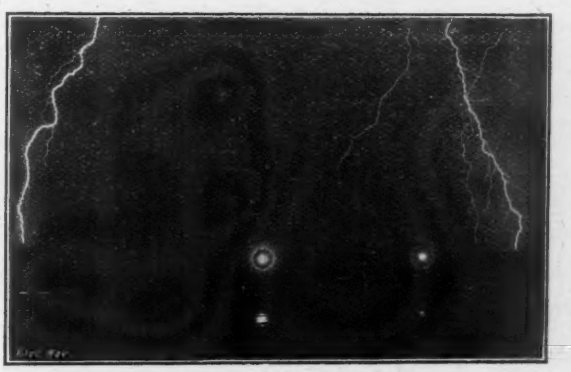
Inquiry.—A correspondent wishes for the address of makers of Oxo-Acetylene welding plant.

Lighting of Airship Routes.—The question of the lighting of airship routes and harbours has been raised in Germany, where it is pointed out that towers equipped with searchlight projectors are very suitable for the purpose, but they fail when the airship is over the clouds, or is in a bank of fog. In the latter event in particular the situation becomes very unpleasant for the aeronauts, seeing that, as happened in connection with the military manœuvres in 1909, a dirigible balloon in the fog may only discover the landing place after hours of wandering about. Landing in fog however, in any case is dangerous owing to the lack of possibility of finding one's bearings. A firm at Aix-la-Chapelle, which is reported to have been occupied with the question for some time past, is stated to have now devised a method of lighting which is probably adapted to render service to airship traffic. The system consists principally in the use of illuminated balloons composed of rubber and having internal electrical lighting, which are caused to rise in connection with a captive balloon or kite carrying the conductors. It is claimed that these are visible at a great distance, and certain colours especially accomplish this object. In case of fog coming on, the inventors have devised a fog signalling apparatus consisting of a hygrometer which, suspended directly from the captive balloon, is to serve the purpose of giving a signal to an observation post on the ground as soon as the lighting balloon has crossed the boundary of the fog. This contrivance, it is claimed, affords a guarantee that the balloon is really above the fog, and can be seen from the airships. It is further submitted that by the choice of balloons of various colours and of varying numbers the lighting balloons can likewise be utilised with advantage for signalling purposes, as, for instance, in giving warning of threatening stormy weather, the prevalence of ground wind, &c., each colour or number of balloons expressing a definite signal.

Chatham Dockyard.—Under a recent order of the Admiralty, the electrical department at his Majesty's dockyard at Chatham will benefit in the matter of establishment, which will include a number of fitters, plumbers, braziers, smiths, labourers, &c., as well as power-station men. The Admiralty has just revised the establishment lists all through the yard, and now the electrical department is a very important feature of the dockyard and the Royal Naval Barracks and Hospital, &c. There is also a very large electrical school at Chatham in connection with the Royal Engineers' School of Military Engineering at Brompton.

Annual Dinner.—The annual dinner of the Electrical Contractors' Association (Inc.) was held on Monday in the Caledonian Station Hotel, Edinburgh. Mr. William Finlay, the retiring president, occupied the chair, and representatives were present from nearly all the industrial centres of England and Scotland. Mr. J. D. Gibson, Edinburgh, president of the Ordained Surveyors' Society, proposed the "Electrical Contractors' Association." Mr. G. Harland Bowden, the new president, in responding, referred particularly to the proposal to consider the desirableness of bringing into line every industry connected with the electrical industry. At the annual general meeting of the Association in the afternoon, Mr. W. R. Rawlings, London, presided.

Lightning Flashes.—We have received from Mr. W. H. Marshall, of Southsea, an excellent photograph of lightning flashes obtained during the recent stormy weather, over the Solent, which we reproduce herewith. The photograph was taken at 9.30 p.m



Lightning Flashes.

on June 9th, and the two discharges were simultaneous, the plate having been exposed only five or six seconds before they occurred. On the left can be made out H.M.S. *Invincible*, whose guns are worked entirely by electricity; on the right are the Spit Fort and Southsea Castle. The curious halo round the arc lamps appears to be due partly to the heavy rain at the time, which accounts also for the reflections from the wet surface of the Common.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the Electrical Review *posted as to their movements.*

Central Station Officials.—The Devonport Town Council on June 9th referred back a recommendation of the Electric Power Committee that the salary of the engineer (Mr. J. W. Spare), be increased from £300 to £350 per annum.

Mr. V. E. Anguine, manager of Hawick electric light works, has been invited to become manager of the Berwick works, in place of Mr. J. Hayward Home, who is leaving for Manchester.

Mr. A. J. Abraham, resident and consulting engineer to the Lanark County Council, was presented with an aneroid barometer by the staff at Cambuslang electricity works on the occasion of his leaving to take up his new appointment at Aberdare, South Wales.

Mr. T. H. Matthews has been appointed shift engineer in the municipal electricity department at Port Elizabeth, and has taken up his duties. Mr. Matthews was formerly with the Shrewsbury Corporation electricity works, and at the Randfontein central power station at Johannesburg.

Walsall Town Council has appointed Mr. S. Whitehouse substation superintendent to the electricity undertaking.

A marriage took place on Tuesday, 14th inst., at Bloomsbury Central Church, Shaftesbury Avenue, between Mr. W. A. Walker, electrical engineer to the Kettering Urban District Council, and Miss Margery Bird, youngest daughter of Mr. T. Bird, J.P., C.C., of Kettering.

Mr. F. E. Frampton has been appointed engineer and manager to the Paignton Electric Light Co.

Tramway Officials.—The Wolverhampton T.C. has decided to retain Mr. C. E. C. Shawfield, electrical engineer, as consulting tramways engineer, and to appoint Mr. H. Vickers as tramways engineer and chief assistant to the general manager, at a salary of £200 per annum.

Mr. R. Baldwin, traffic manager on the Burton and Ashby Light Railway, was last week appointed to a better position in the Bournemouth Corporation Tramways Department.

General.—Mr. Henry M. Sayers, of 39, Victoria Street, S.W., has been appointed resident engineer in Santos, Brazil, to the City of Santos Improvements Co., Ltd., and he sailed to take up his new position on Friday, June 10th, by the R.M.S.P. Co.'s ss. *Amazon*. Mr. Sayers will have in his charge the water supply, electric light and power supply, electric and mule tramways, and the steam railway undertakings owned and operated by the City of Santos Improvements Co. Mr. Sayers has transferred his consulting practice to his eldest son, Mr. W. H. Sayers.

Mr. C. E. Vormeister has resigned his position as lecturer in the Electrical Engineering Department of the Royal Technical Institute, Salford. He sails for Brisbane on July 22nd, and informs us that he is open to represent British firms out in Australia.

Mr. R. B. Slacke who, as a director of the Key Engineering Co., Ltd., is known to a number of our readers as one of the pioneers of the large gas engine movement in this country, is about to join the staff of Messrs. Galloways, Ltd. Messrs. Galloways as our readers know, are now manufacturing the Ehrhardt & Sehmer gas engine at their works at Manchester. The Key Engineering Co. will continue to act as agents for the Ehrhardt & Sehmer gas engine, and will, as hitherto, quote alternatively for these engines made at either the English or the German works.

According to a financial contemporary, Mr. Henry L. Cripps, who has joined the board of the Victoria Falls and Transvaal Power Co., has been for a long time at the head of the firm of Messrs. Dyson & Co., Parliamentary agents, at Westminster, from which he is retiring.

According to the *Times*, the members of the Japanese Naval Commission who are visiting England, were on Wednesday evening entertained at dinner at the Ritz Hotel by Mr. Alexander Siemens.

Col. R. E. B. Crompton, C.B., has been appointed consulting engineer to the Road Board, of which Sir George Gibb is chairman.

In the *Daily Telegraph* of yesterday we read of the splendid heroism of an electrical engineer in India—a letter from whom, by the way, appears in our "Correspondence" section to-day:—"The Royal Humane Society have granted the silver medal to George R. Drummond, electrical engineer to the Maharaja of Bikaner, Rajputana, India, for his gallantry in saving one man, and attempting to save two others, who were rendered unconscious in a well 320 ft. deep. Three times Mr. Drummond went down, each time bringing up a man, and he himself then collapsed, but recovered later."

Obituary.—Mr. A. E. Robinson.—The death has occurred, at the age of 26 years, of Mr. Albert Edward Robinson, who held the position of electrician at the Prescall Salt Mines, Lancs.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

S. H. Heywood & Co., Ltd. (94,580).—Return dated March 30th, filed April 10th. Capital £12,000 in £1 shares. 8,007 shares taken up. £7 paid. £8,000 considered as paid. Mortgages and charges: Nil.

Howard Asphalt Troughing Co., Ltd. (69,270).—Return dated April 19th, filed April 14th. Capital £20,000 in £1 shares (1,000 deferred). 5,007 ordinary and 1,000 deferred shares taken up. £4,007 paid. £2,000 considered as paid. Mortgages and charges: Nil.

Radyr Electric Co., Ltd. (95,997).—Issue on May 14th of £300 debentures, part of a series of which particulars have been already filed.

Aluminium Corporation, Ltd.—Trust deed dated May 18th, 1910, to secure £50,000 debenture stock. Property charged: Certain lands and premises in Caerhun, Dolgarrog Abbey, Dolgarrog, Llanrhychwyn, Trefriw and Maenan, rights and privileges, &c. Trustees: London General Investment Trust, Ltd., 12, Moorgate Street, E.C.

Cryselco, Ltd. (58,218).—Trust deed dated May 6th, 1910, to secure £7,500 first and £7,500 second debenture stock. Property charged: Land, factory and other buildings at Kempston, known as "Kempston Works," and the company's undertaking and property, present and future, including uncalled capital. Trustees: A. Baker, Billiter House, Billiter Street, E.C.; and H. S. Deacon, Kempston, Beds.

Hindhead and District Electric Light Co., Ltd. (75,361).—Issue on May 13th, 1910, of £1,050 debentures, part of a series of which particulars have already been filed.

Electric Batteries and Carbons, Ltd. (97,710).—Debenture dated April 25th, 1910, to secure £1,000, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: R. G. Orr, "The End House," Cavendish Road West, N.W.

Durham Collieries Electric Power Co., Ltd. (83,421).—Issue on May 10th of £10,600 debentures, part of a series of which particulars have already been filed.

CITY NOTES.

British Electric Traction Co., Ltd.

The directors' report which is to be submitted to-day (Friday) at the meeting at the Holborn Restaurant, relates to the year ended March 31st, 1910, and to it are appended various schedules giving particulars of the items appearing in the balance-sheet and profit and loss account, and also schedules relating to the business of the associated companies.

Balance sheet.—Capital and reserve accounts.—The subscribed share and debenture capital of the company at March 31st, 1910, was:—

£1,333,010 in ordinary shares of £10 each.
£1,614,370 in 6 per cent. cum. pref. shares of £10 each.
£1,470,653 in 5 per cent. perpetual debenture stock.
£475,730 in 4½ per cent. second debenture stock.

The directors have purchased in the market £3,000 5 per cent. perpetual debenture stock, and £53,206 4½ per cent. second debenture stock of the company. The issued debenture stocks have been reduced by those amounts, and the difference of £16,384 between the purchase price and the nominal value has been transferred to the reserve. The amount of reserve at March 31st, 1909, was £602,420. This account has since been credited with the profit of £10,398 made on sale of investments during the past year, and debited with various losses, and at March 31st, 1910, it stood at £618,532. It will be further increased by the sum of £15,000 proposed to be transferred to reserve out of the profits of last year. In addition, reserves amounting to £58,752 have been made from time to time out of profits against loss and depreciation of specific assets. The various associated companies have created depreciation and reserve funds of their own, which amounted at December 31st, 1909 (including balances carried forward), to £1,175,997.

The total amount of creditors at March 31st, 1910, was £10,887, and in addition £46,623 debenture interest had accrued at that date and has since been paid. Investments and undertakings stand at £4,997,846, and consist of shares and debentures in associated tramway, electricity supply, manufacturing and other companies, consols, and sundry securities and undertakings, as follows:—

Consols of the par value of £200,000 standing in the books at ..	£196,374
Debentures in various companies of the par value of £428,181 standing in the books at	408,084
Shares in various companies of the par value of £4,411,497 standing in the books at	4,254,680
Capital expended at Barrow, Brighton and Mumbles, less reserve of £15,500	138,758
	£4,997,846

The amount of sundry debtors and debit balances stand at £447,948, and shows a reduction on the amount at March 31st, 1909.

The expenditure on and in connection with the new building in Kingsway amounts to £42,037. It has been arranged to grant a lease of this building to the British Electrical Federation for a period of 21 years. There is also a sum of £2,776 in respect of other buildings and land.

The item "expenditure on Acts of Parliament, &c.," has been increased during the year, and now stands at £26,784. It is being written down annually by 20 per cent. Stock stands at £9,127 after making provision for depreciation. Goodwill stands at £1,000 and is the balance of a larger amount. Furniture stands at £4,261, and is being written down annually by 10 per cent. The British Electrical Federation pays this company £300 per annum for the use of the furniture. Cash stands at £91,361.

Profit and Loss Account.—The net profit after reserving £12,500 against depreciation of undertakings worked by the company, buildings and freehold land, doubtful debts and expenditure on undertakings not proceeded with, and after transferring to reserve the profit of £10,398 on sales of investments, is £130,564, to which must be added the sum of £20,203 brought forward, making a total of £150,768. After deducting the interest on the 5 per cent. perpetual debenture stock and the 4½ per cent. second debenture stock

for the year, amounting to £97,485, there remains a balance of £53,283, out of which it is proposed to pay a dividend of 3s. per share on the preference shares amounting to £24,216, and to transfer a sum of £15,000 to reserve, leaving a net balance of £14,067, which the directors propose should be carried forward. This dividend will bring the payment of the full dividend on the 6 per cent. cumulative preference shares of the company to June 30th, 1908, and the reserve will be increased from £618,582 to £633,582. The yield for the past year on the total investments and undertakings standing in the books at £4,997,845 was 2·63 per cent., as compared with 2·5 per cent. for the preceding year on £5,037,095.

General.—For some years past the directors have made every effort by increasing fares, eliminating unremunerative services and by similar means to increase the profits of the tramway undertakings, and they have been successful in arresting the steady decline in the receipts per passenger. The directors, feeling that other measures were necessary in order to obtain a positive improvement of the profits, have during the past year given much time and attention to the examination of various schemes for increasing the net profit on the working of tramways, keeping in view the importance of not increasing the fares to an extent likely to deter traffic. As a result the "Fair fare" system has been devised. Many of the federated companies have adopted this system, which has been explained in a pamphlet circulated among the shareholders. The directors are glad to be able to say that during the past few months there has been a marked improvement in the traffic receipts on the tramways undertakings, but there has not yet been sufficient experience of the "Fair fare" system to enable them to say definitely to what extent the improvement is the result of the adoption of this system or is due to better weather conditions and improved trade. The various lighting undertakings in which the company is interested show steady improvement, but owing to the introduction of metallic-filament lamps the advance in net profits has, to some extent, been checked. The electrical manufacturing industry is still in a very unsatisfactory condition, and the accounts of the Brush Electrical Engineering Co. for the past year show a loss. With regard to the other branches of the company's operations, and particularly the development of new electrical enterprises, the directors feel that opportunities for promoting new tramway and lighting undertakings in this country with a prospect of reasonable profit are rare. This is undoubtedly a matter for general regret, especially when it is admitted by the Light Railway Commissioners that the construction of many much-needed lines could be effected by the amendment of some of the provisions of the Light Railways Act, 1896.

Having regard to the general position of the company, the policy by which the directors are guided may be stated as follows:—

To meet depreciation, the Associated Companies have made various reserves which amount to £1,175,997; moreover, the B.E.T. Co. itself has a reserve of £633,582, which is also available to meet depreciation. The increase of these reserves is a matter to which the attention of the directors is constantly given, and while they recognise that the depreciation of assets which has occurred may be in excess of the existing reserves, they consider that it would be incorrect under the existing conditions to make any valuation based upon the present market quotations of the company's own shares and debenture stocks, which, in the opinion of the directors, show an unduly exaggerated depreciation. They propose for the immediate future to deal with the depreciation as, and when its amount is, ascertained, and so long as such depreciation continues to transfer to reserve any profits or losses (other than accrued dividends or interest) made by realisation of present investments. The accounts for the year are made up on this principle. They recommend also an annual addition to reserve out of net profits. With regard to the management of the Associated Companies, an efficient organisation for the administration and working of the various undertakings has been established by means of the British Electrical Federation, and the results show that compared with other enterprises of a similar kind, the associated undertakings are being economically worked. It is satisfactory to state that the company has control of large financial resources, which are available either for the development of existing undertakings or for employment in new enterprises. The cash in hand and Consols alone represent a large sum, and there are other investments which could be realised either without loss, or at a profit, whenever opportunities for the employment of capital in more profitable directions present themselves. Although the directors are of opinion that the scope for safe and profitable expansion in this country is at present very restricted, they believe that opportunities will occur for granting financial aid to existing electrical undertakings on profitable terms. The directors have recently met with some success in their endeavours to secure participations in electrical enterprises abroad, and they are giving their attention to several other promising schemes. They have also acquired interests in some new branches of enterprise, which, although not strictly electrical, can be worked conveniently and profitably with the company's existing organisations. In these ways the directors hope not only to increase the financial resources of the company, but also to find profitable employment for them, and to gradually increase the net profits.

Prospectus.—*Anglo-Argentine Tramways Co., Ltd.*—This company is offering until Monday next, £1,500,000 5 per cent. debenture stock at 96½ per cent., for purposes which were fully explained at the recent meeting of the company, which was reported in our issue of last week.

Globe Telegraph and Trust Co., Ltd. — The report for the year ended May 31st, 1910, shows that the net revenue for the year, after deduction of expenses, amounts to £209,118, and makes, with the balance of £27,305 brought forward, a total of £236,423. From this amount there has been distributed the sum of £131,085 in interim dividends, leaving an available balance of £105,338. The directors now recommend the payment of the following final dividends, viz., 3s. per share, less income-tax, on the preference shares, making with previous distributions a total dividend for the year on those shares at the rate of 6 per cent. per annum, less income-tax; and 5s. 9d. per share net on the ordinary shares, making, with previous distributions, a dividend on these shares at the rate of 5⅞ per cent. net for the year. These dividends will absorb the sum of £77,656, and leave £27,681 to be carried forward. During the year £43,050 Anglo-American Telegraph Co.'s preferred stock has been sold, the proceeds having been invested in suitable securities.

R. Waygood & Co., Ltd.—The directors' report for the year ending March 31st, 1910, states that the profits earned, including £3,159 brought forward, amount to £23,755. The managing director's and directors' fees absorb £2,800; dividend on preference shares, £8,100; further amount placed to reserve, £1,000; experimental work, written off, £1,090; interim dividend on ordinary shares, £3,375, leaving a balance of £7,390. The directors recommend that a further dividend be declared at the rate of 7 per cent. per annum for the six months ending March 31st, 1910, making, with the interim dividend already paid, 6 per cent. for the year on the ordinary shares, which will require £4,725, leaving £2,665 to carry forward.

Havana Electric Railway Co.—The report of this company for 1909 shows (says the *Financial News*) gross earnings from all sources $2,488,647, an increase of $211,840. The gross earnings from the railway were $2,106,761; operating expenses of railway, $955,236; net earnings of railway, $1,151,524. The gross earnings from stages, $381,886; operating expenses of stages, $295,812; net earnings of stages, $86,073; total net earnings, $1,237,598; fixed charges and taxes, &c., $443,984; collected during year on suspense account, &c., $22,717; surplus earnings available for dividends, $816,331; and 3 per cent. has been declared on the common shares, leaving balance for year to profit and loss account, $292,420.

Birmingham and Midland Tramways, Ltd.—The directors' report for the year ended December, 1909, states that the total revenue from all sources was £99,713, compared with £97,004 in the previous year. The expenses for the year amounted to £48,710, against £45,639. After providing for all expenses chargeable to revenue, including repairs, maintenance, sums payable to corporations, and placing £3,000 to renewals account, there remains £48,003, plus £92 brought forward. A dividend on the preferred ordinary shares at the rate of 1¼ per cent. for the year is recommended, carrying forward £4,524.

Companies Struck Off the Register.—The following companies have been struck off the Register, and are accordingly dissolved:—

Acoustic Patents (France), Ltd.
Beeston Accumulator Syndicate, Ltd.
Birmingham Electrobus Co., Ltd.
Electric Canal Haulage Co., Ltd.
Electric Mercantile Agency, Ltd.
Ideal Dry Seat Syndicate, Ltd.
International Telegraphic Appliances, Ltd.
Lancashire and Yorkshire Electrobus Co., Ltd.
Liverpool Electrobus Co., Ltd.
Manchester Electrobus Co., Ltd.
Nottingham Electrobus Co., Ltd.
Nottingham Gas and Electric Fittings Co., Ltd.
Producer Gas Lighting Trust.
Provincial Electrobus Co., Ltd.
Richardson Electrical Co., Ltd.
Scottish Electrobus Co., Ltd.
Tramways Development Co., Ltd.

San Paulo Tramway, Light and Power Co., Ltd.—The directors have declared a quarterly dividend of 2½ per cent.

Calcutta Electric Supply Corporation, Ltd.—The number of units delivered to consumers during the four weeks ended April 29th, 1910, were 780,512, compared with 573,738 units in the corresponding four weeks of 1909.

Aron Electricity Meter, Ltd.—The directors have decided to recommend, at the annual meeting to be held on June 24th, the payment of 9 per cent. on the preference shares, making 12 per cent. for the year.

Stock Exchange Notice.—Applications have been made to the Committee to allow the following securities to be quoted in the Official List:—

Calcutta Electric Supply Corporation.—Further issue of 20,000 5 per cent. cumulative preference shares of £5 each, fully paid, Nos. 140,351 to 160,350, and 20,350 5 per cent. cumulative preference shares of £5 each, £2 paid, Nos. 120,051 to 140,350.

Canadian General Electric Co., Ltd.—The directors have declared a dividend of 1¾ per cent. on the common stock for the three months to the 30th inst., being at the rate of 7 per cent. per annum. The transfer books will be closed from June 15th to June 30th.

ELECTRIC TRAMWAY AND RAILWAY TRAFFIC RETURNS.

Locality.	Fortnight ended	Receipts for the fortnight. £	Receipts for the fortnight. £*	No. of wks.	Total to date. £	Total to date. £*	Route miles open.	Inc.
†Aberdeen	May 31	1,911	+ 77	52	70,076	— 668	..	..
Ayr	June 11	607	+ 51	4	1,125	+ 2	8	..
†Bath	,, 1	769	— 343	22	16,412	+ 1,889	..	..
†Belfast	,, 3	3,886	— 36	9	35,910	+ 572	37	..
Birkenhead	,, 12	2,951	+ 77	10	11,232	+ 3	18·68	..
Birmingham Corp.	,, 4	13,078	—1,108	9	62,710	— 487	56·4	..
Blackburn	,, 8	1,180	— 489	10⅝	11,618	— 936	14·12	..
Blackpool Corp.	,, 9	1,625	— 2,085	..	8,323	— 1,862	..	..
Blackpool-Fleetw'd	,, 11	1,084	—1,206	23	9,304	— 88	..	..
Bolton	,, 5	4,632	— 98	10	22,009	— 1,268	26	..
Bournemouth	,, 8	3,196	— 462	9⅞	16,187	— 883	21·96	..
Bradford	,, 4	10,103	— 708	10	46,955	— 268	54·81	..
Brighton	,, 12	1,871	— 266	10⅞	9,418	— 607	9·5	..
Bristol	,, 10	11,546	— 927	..	..	..	..	..
Brit. Elec. Trac. Co.								
Airdrie	,, 3	441	— 10	22	4,731	+ 82	3·65	..
Barnsley	,, 3	315	— 79	,,	3,759	+ 90	..	..
Barrow	,, 3	539	+ 14	,,	5,260	+ 617	5·37	..
Cavehill	,, 3	197	— 10	,,	1,756	+ 155	..	..
Devonport	,, 3	833	— 80	,,	8,986	+ 954	8·85	..
Gateshead	,, 3	1,909	— 80	,,	21,023	— 472	11·25	..
Gravesend	,, 3	297	— 122	,,	4,255	+ 67	6·5	..
Greenock	,, 3	1,444	+ 239	,,	12,580	+ 1,746	7·25	..
Hartlepool	,, 3	472	— 118	,,	4,767	+ 137	6·72	..
Kidderminster	,, 3	132	— 143	,,	2,072	+ 52	..	..
Leamington	,, 3	316	— 196	,,	3,278	— 135	..	..
Merthyr	,, 3	391	— 118	,,	4,316	— 244	2·9	..
Metropolitan	,, 3	15,251	+ 5	,,	156,043	+28,450	22	..
Middleton	,, 3	790	— 27	,,	6,511	— 490	8·5	..
Mid. Joint Com'tee	,, 3	11,499	—1,815	,,	123,183	+ 2,625	..	..
Oldham—Ashton	,, 3	1,150	— 75	,,	11,849	— 131	9·18	..
Peterborough	,, 3	213	— 88	,,	2,306	— 40	5·31	..
Potteries	,, 3	3,311	— 600	,,	37,998	— 642	29	..
Rothesay	,, 3	402	+ 95	,,	1,987	+ 26	2·75	..
Southport	,, 3	664	— 98	,,	5,796	+ 213	8·17	..
S. Metropolitan	,, 3	1,803	— 345	,,	17,101	+ 874	..	..
Swansea	,, 3	2,096	— 245	,,	22,262	+ 2,315	12·5	..
Tynemouth	,, 3	464	— 210	,,	3,877	+ 266	3·75	..
Weston-s-Mare	,, 3	257	— 251	,,	1,437	— 93	3	..
‡Worcester	,, 3	558	— 138	,,	5,690	+ 59	5·75	..
Wrexham	,, 3	181	— 41	,,	2,078	+ 9	..	..
Yorks. Wool. Dist.	,, 3	1,889	— 265	,,	21,045	+ 1,847	17	..
Miscellaneous	,, 3	401	— 96	,,	4,260	+ 170	..	..
Burnley	,, 11	2,458	— 172	..	..	..	..	..
Burton-on-Trent	,, 12	538	— 24	10	2,742	— 33	6·62	..
Bury	,, 12	2,419	— 234	10⅞	12,315	— 675	22·5	..
Cardiff	,, 4	4,422	— 457	10	20,295	— 471	..	..
†Carlisle	..	..	..	..	..	..	..	..
Chatham and Dist.	,, 9	1,817	— 157	23	18,305	+ 770	14·98	..
†Cork	,, 2	516	+ 15	..	10,058	+ 1,617	9·89	..
Croydon	..	..	..	..	..	..	..	..
†Darlington	,, 11	190	+ 16	11	2,093	+ 51	..	..
†Darwen	,, 10	250	+ 94	10	2,474	— 179	4·36	..
Dover	,, 4	404	— 53	9	1,918	— 83	4·75	..
Dublin	,, 10	10,571	— 826	..	120,196	+ 3,613	54·25	..
Dundee	,, 8	2,426	+ 58	37	4,180	+ 11	15·5	..
East Ham	,, 11	2,086	— 74	10⅞	10,643	+ 70	8·5	·77
†Exeter	,, 8	317	— 363	9	2,851	— 708	5·5	..
Glasgow	,, 11	57,410	+1,097	..	..	..	97·25	..
†Hastings	,, 2	884	— 489	..	..	..	..	..
Huddersfield	,, 10	3,508	— 166	10	18,016	+ 660	28·5	·5
Hull	,, 11	5,358	+ 339	10	27,411	+ 1,873	14·5	1·5
Ilkeston	,, 9	218	— 46	10	1,211	— 85	..	..
†Ipswich	,, 4	409	— 124	9	3,582	— 22	10·12	..
†Kilmarnock	,, 4	146	— 5	8	438	— 17	4·25	..
Lancashire United	,, 8	2,499	— 416	..	28,986	+ 72	89	..
Leeds	,, 4	13,826	— 950	9	65,052	+ 1,728	..	..
Leicester	..	..	..	..	..	..	..	..
†Leith	,, 4	603	— 7	2⅞	1,795	— 20	9	2
Liverpool	,, 11	22,148	— 217	22½	238,695	+ 6,877	113·5	6
‡L.C.C.	May 21	91,490	+20,541	..	805,193	+44,867	132·2	13 8
†London United	June 4	6,667	- 2,988	..	132,284	+ 7,243	..	..
Lowestoft	..	..	..	..	..	..	..	..
Manchester	,, 11	31,081	— 825	10	157,756	+ 1,173	183	1
Newcastle	,, 11	7,785	— 88	..	39,095	— 816	14·5	..
†Newport	,, 4	673	— 16	10	6,777	+ 114	14·5	..
Oldham	,, 12	3,689	— 112	11	21,035	— 1,214	23·75	..
Pontypridd	..	..	..	..	..	..	..	..
Portsmouth	,, 11	4,142	— 630	10	19,902	— 1,452	14·5	·75
Preston	,, 8	1,289	— 481	10	7,224	— 388	..	..
Rotherham	,, 3	..	..	..	..	..	..	..
Salford	,, 6	9,054	—1,557	9⅔	44,038	— 862	..	..
Sheffield	,, 12	11,847	+ 59	11⅔	67,462	+ 3,520	39·8	·8
Southampton	,, 8	2,216	— 172	10	10,658	+ 272	..	..
Southend-on-Sea	,, 8	1,094	+ 527	10	4,926	+ 289	..	..
South Shields	,, 11	1,102	— 93	10⅔	5,490	— 179	..	..
†Swindon	,, 1	126	— 32	..	..	..	..	..
†Tyneside	,, 1	400	— 148	22	8,628	— 328	..	..
Wallasey	,, 11	1,887	— 181	10⅔	9,846	— 480	..	..
Walthamstow	,, 11	1,497	+ 283	10	7,359	+ 238	9	..
West Ham	,, 2	4,940	— 467	9	21,846	— 49	15·25	..
Wolverhampton	,, 8	1,699	— 317	10	8,954	+ 635	14·25	1·75
Baker St.-Waterloo	,, 11	6,415	— 355	23	78,540	+ 1,650	4·25	..
Cen. London Rly.	,, 11	11,984	+ 174	23	129,897	+ 2,394	6·22	..
Char. +, Eus. Hamp.	,, 11	7,2 0	—1,075	23	88,896	— 945	7·75	..
†City & S. Lon. Rly.	,, 5	3,215	— 36	22	71,545	+ 198	7·26	..
†Dublin-Lucan Rly.	,, 3	199	— 68	22	2,731	+ 29	7	..
G.N. and City Rly.	,, 11	2,754	+ 6	23	34,017	— 486	3·5	..
G.N., P'ty. & Brmtn.	,, 11	11,110	— 575	23	138,565	+ 5,330	9·25	..
L'pool Overh'd Rly.	,, 12	2,754	— 98	..	33,139	+ 691	6·5	4·5
Llandudno-Col. Bay	,, 3	531	— 243	250	4,330	+ 121	..	..
Mersey Railway	,, 11	4,217	+ 27	23	46,691	+ 1,196	4·5	..
Metropolitan Rly.	,, 12	35,359	+ 360	..	382,766	+12,957	24·5	..
Met. District Rly.	,, 11	21,735	+ 682	23	250,746	+23,639	24	..
†Anglo-Argentine	,, 8	43,902	+4,031	..	971,785	+106,937	..	..
§Auckland	May	14,848	+1,715	20	73,929	+ 5,041	23·98	·68
Bombay (B.E.T.)	May 23	5,681	+ 17	19	52,504	+ 3,695	..	..
§Brisbane	April	17,690	+2,160	..	..	..	..	..
§Brit. Columbia Rly.	..	..	..	..	..	..	..	..
†Ca'cutta	June 4	3,323	+ 70	..	..	..	..	..
§Cape Elec. T., Ld.	..	..	..	..	..	..	..	..
§Kalgoorlie, W.A.	April	3,425	..	..	13,465	..	30·5	..
Madras	May 31	1,292	+ 248	..	13,818	+ 1,044	..	..
§Lisbon	..	..	..	..	..	..	..	..
Perth (W.A.)	June 10	2,941	+ 221	..	35,880	+ 2,698	29	1

* Compared with the corresponding period of 1909. † One week only.
‡ Includes horse, steam and other receipts. § One month.

STOCKS AND SHARES.

Tuesday Evening.

Last week's reduction in the Bank Rate came sufficiently unexpectedly to give a general fillip to prices in all the investment sections of the Stock Exchange, and Consols led a good advance, which spread to rubber shares and certain other of the semi-speculative markets. The outstanding feature amongst the movements recorded on the following pages is a further remarkable spurt in Anglo-American Telegraph Deferred stock.

The strength imparted by the Bank Rate to the Home Railway market did not take long to wear off. Absence of business is advanced as the reason for the crumbling away, which led to Metropolitans falling ½ and Districts ¼. Central London Ordinary dropped a couple of points, the traffics not coming up to some of the more sanguine anticipations. City and South London lost ½. In other directions, the Home Railway market has been weak, a sharp fall in Brighton Deferred attracting attention. Guesses at truth rumoured a coming new issue of stock as a preliminary to electrification of the line all the way to Brighton.

Another jump in Anglo-American Telegraph Deferred stock took the price to 30⅜, which is higher than it has been for at least a score of years. Although, strictly speaking, there is no arrangement with the Commercial Cable Company, a bond of union has been established with the American Telephone and Telegraph Company, and economies in working are already in sight. The Ordinary stock has risen 6, the Preferred 9 and the Deferred 3½, while Direct United States gained 10s. Mackay Companies' Common shares, *ex* 1¼ dividend, are marked 3½ points down, but the Preferred shows no more than 1 per cent. fall, the amount of the deducted dividend.

Excitement over the Anglo-American matter is completely dwarfing interest in other telegraph securities. West Coast of America fell 1/16 and the Debentures ½. Pacific and European 4 per cent. Debentures lost 1½ on a small selling order.

Rubber shares again occupy a leading place in Stock Exchange markets, and the revival of the past few days was checked by a good deal of scattered profit-taking. Business is hardly so active as the sharp fluctuations might lead one to suppose, and a certain amount of buying has come from people who went short of the shares quite recently, when it looked as though the market were going to slump. The overloaded bull account, however, has been weeded down to more manageable proportions by this time, and, in the abrupt fall, shares passed from weak holders to stronger hands. The position in the Rubber market is a good deal healthier now than has been the case for a long while past.

The report of the British Electric Traction Company is lamentably bad, but the Preference shares have recovered half the 5s. lost last week, and the Second Debenture stock rose 2. In explanation of these improvements, it is urged that the report might have been worse! The Preference dividend goes yet further into arrears, it being paid in full up to June 30th, 1908. London United Tramways Preference are 5s. lower at 2¼, the Debenture stock keeping about 69. Metropolitan Electric Tramways Preference shares at 1 1/16 are 1/32 harder. The Canadian-Mexican group is fairly steady, and other tramway descriptions are too quiet to call for special comment.

Electric Supply shares and stocks show little change. Charing Cross Ordinary are ⅛ lower, but none of the other London issues have moved. The advertising campaign which is being vigorously conducted is hardly likely to yield visibly substantial results to individual undertakings, but its force cannot fail to make itself felt, if the first steps are properly followed up. Whether the month of June is the most suitable for crusading on behalf of illuminants may be open to some little question; but, of course, the arguments in favour of the use of electricity for cooking and other domestic purposes are all the more appealing when the temperature is 80 or upwards in the shade.

Telegraph Constructions are 10s. higher at 34. British Westinghouse Preference nominally are a trifle lower; but nearly all the attention this week has gone to rubber shares and the Anglo-American Cable Companies' issues, to the exclusion of interest in manufacturing and other miscellaneous descriptions.

Liverpool Electric Cable Co., Ltd.—At a board meeting, held last week, an interim dividend of 5 per cent. per annum was declared.

India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.—The directors have declared an interim dividend of 5s. per share on the ordinary shares.

SHARE LIST OF ELECTRICAL COMPANIES.

TELEGRAPH AND TELEPHONE COMPANIES.

Present Issue.	NAME.	Stock or Share. *	Dividends for the last four years.				Closing Quotations June 7th.	Closing Quotations June 14th.	Business done week ended June 14th, 1910.		Rise + or Fall —	Present Yield per cent.
			1906.	1907.	1908.	1909.			Highest	Lowest		£ s. d.
25,000	Amazon Telegraph Co.'s shares, Nos. 1 to 25,000	10	Nil	Nil	Nil	Nil	8⅜ — 8⅞	8⅜ — 8⅞	..	..	..	Nil.
116,200	Do. do. 5 % Debs., Nos. 1 to 1,256 Red.	100	5 %	5 %	5 %	5 %	100½—102½	100½—102½	..	..	+ ⅛	4 17 7
$255,196,00	American Telephone & Telegraph, Cap. Stock ..	$100	9 %	8 %	8 %	8 %	138 —140	138 —140	..	..	−2	5 14 4
$58,000,000	Do. Collat. Trust, 4% Bonds, 1 to 28,000 and 53,001 to 78,000	$1000	4 %	4 %	4 %	4 %	93 — 95	93 — 95	..	..	..	4 4 8
558,460	Anglo-American Telegraph	Stock	3½%	3½%	£3 4s.	3⅜%	64 — 66	69 — 71	66	..	+5	5 2 1
3,220,770	Do. do. do. 6 % Pref.	Stock	6 %	6 %	6 %	6 %	104 —106	112½—114½	107½	104	+8	5 4 10
3,220,770	Do. do. do. Deferred	Stock	1⅝%	1 %	8/-	25/-	26½— 27	30 — 30½	30½	27	+3½	4 2 8
47,725	Anglo-Portuguese Tel., 5 % Mort. Deb. Stock Red.	100	5 %	5 %	5 %	5 %	100 —102	00 —102	..	..	..	4 18 0
44,000	Chili Telephone, Nos. 1 to 44,000	5	8 %	8 %	8 %	8 %	7⅛— 7⅛	7⅛— 8 3/16	..	..	..	4 18 6
3,449,176	Commercial Cable, Sting. 500 year 4% Deb. Stk. Red.	Stock	4 %	4 %	4 %	4 %	86 — 88	86 — 88	88½	..	..	4 10 11
16,000	Cuba Telegraph	10	5 %	6 %	6 %	6 %	8½— 9	8½— 9	8 11/16	..	..	6 13 4
6,000	Do. 10 % Pref.	10	10 %	10 %	10 %	10 %	16½— 17½	16½— 17½	..	..	..	5 17 8
12,981	Direct Spanish Telegraph, Ord.	5	4 %	4 %	4 %	..	3½— 3⅝	3½— 3⅝	..	..	..	5 3 3
6,000	Do. do. 10 % Cum. Pref. ..	5	10 %	10 %	10 %	10 %	7⅞— 8½	7⅞— 8½	..	..	..	6 1 3
60,000	Do. do. 4½ % Debs.	50	4½%	4½%	4½%	4½%	100 —102	100 —102	..	..	..	4 8 8
60,710‡	Direct United States Cable	20	4½%	4½%	4½%	4 %	15 — 15½	15½— 16	15⅞	15½	+ ⅛	5 0 0
39,500	Direct W. India Cable, 4½ % Reg. Deb., 1 to 1,208, R.	100	4½%	4½%	4½%	4½%	100 —102	100 —102	..	..	..	4 8 8
4,000,000	Eastern Telegraph, Ord. Stock..	Stock	7 %	7 %	7 %	..	133 —136	133 —136	135	133	..	5 2 11
2,000,000	Do. 5½ % Pref. Stock..	100	5½%	5½%	5½%	5½%	85 — 87	85 — 87	86⅞	85½	..	4 0 6
1,896,706	Do. 4 % Mort. Deb. Stock. Red. ..	Stock	4 %	4 %	4 %	4 %	101 —103	101 — 103	102½	..	..	3 17 8
800,000	Eastern Extension, Australasia, and China Tele	10	7 %	7 %	7 %	7 %	12⅞— 13½	12⅞— 13½	13 1/16	12¾	..	5 5 8
759,400	Do. 4 % Deb. Stock	Stock	4 %	4 %	4 %	4 %	101 —103	101 —103	..	..	..	3 17 8
200,000‡	East. & S. Afric. Tel., 4 % Mt Db. Mauritius Sub.) 1 to 8,000	25	4 %	4 %	4 %	4 %	99½—101½	99½—101½	..	..	..	3 18 10
181,127	Globe Telegraph and Trust	10	5⅓%	5⅓%	5⅓%	5⅓%	10⅜— 10⅞	10⅜— 10⅞	10⅞	10½	..	5 5 9
181,127	Do. do. 6 % Pref.	10	6 %	6 %	6 %	6 %	13 — 13½	13 — 13½	..	..	..	4 8 11
150,000	Great Northern Telegraph, of Copenhagen.. ..	10	20 %	20 %	18 %	..	30½— 31½	30½— 31½	..	..	..	5 16 8
5,000	Halifax and Bermudas Cable, 4½ % 1st Mort. Debs., within Nos. 1 to 1,200, Red.	100	4½%	4½%	4½%	4½%	100 —102	100 —102	..	..	..	4 8 8
17,000	Indo-European Telegraph	25	13 %	13 %	13 %	13 %	53 — 55	53 — 55	..	..	..	6 15 8
$41,880,400	Mackay Companies Common	$100	5½%	4 %	4 %	4½%	90 — 93	90 — 93	..	..	..	4 11 5
$50,000,000	Do. do. 4% Cum. Pref.	$100	4 %	4 %	4 %	4 %	77 — 80	77 — 80	..	..	..	5 0 0
894,190	Marconi's Wireless Telegraph	1	Nil	Nil	Nil	..	1⅛ — 1⅛	1⅛ — 1⅛	..	..	..	Nil
72,680	Monte Video Telephone Co., Ltd. Ord.	1	6 %	6 %	6 %	6 %	⅞ — 1	⅞ — 1	..	..	..	6 0 0
86,492	Do. do. do. 5 % Pref.	1	5 %	5 %	5 %	5 %	⅝— ⅞	⅝— ⅞	..	..	..	5 6 8
2,225,000	National Telephone, Pref. Stock	100	6 %	6 %	6 %	6 %	104½—106	104½—106	105	104½	..	5 13 22
3,725,000	Do. do. Def. Stock	100	5 %	6 %	6 %	6 %	124 —126	124 —126	125	124⅛	..	4 15 8
15,000	Do. do. 6 % Cum. 1st. Pref.	10	6 %	6 %	6 %	6 %	10 — 10⅜	10 — 10⅜	..	..	..	5 11 8
15,000	Do. do. 6 % Cum. 2nd Pref.	10	6 %	6 %	6 %	6 %	10 — 10⅜	10 — 10⅜	10 1/16	..	..	5 11 8
250,000	Do. do. 5 % Non-cum. 3rd P., 1 to 250,000	5	5 %	5 %	5 %	5 %	5¼ — 5⅜	5¼ — 5⅜	..	..	..	4 10 11
2,000,000	Do. do. 8½ % Deb. Stock Red. ..	Stock	8½%	8½%	8½%	8½%	97 — 99	97 — 99	97½	..	..	8 18 11
1,988,598	Do. do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	100 —102	100 —102	100½	100	..	3 18 5
179,813	Oriental Telep. and Elec. 1 to 171,504, fully paid ..	1	7 %	8 %	8 %	8 %	1 7/16 — 1 9/16	1 7/16 — 1 9/16	81/3	80/7½	..	4 14 10
50,000	Do. do. do. 8 % Cum. Pref.. ..	1	6 %	6 %	6 %	6 %	1 5/16 — 1 7/16	1 5/16 — 1 7/16	..	..	..	4 14 9
196,955	Do. do. do. 4 % Red. Deb. Stock ..	100	4 %	4 %	4 %	4 %	88 — 90	88 — 90	..	..	+1	4 8 11
99,400	Pacific & European Tel., 4 % Guar. Debr., 1 to 1,000	100	4 %	4 %	4 %	4 %	98½—100½	97 — 99	96	..	−1½	4 0 10
11,839	Reuter's	8	5 %	5 %	5 %	5 %	7¼— 8xd	7⅛— 8	..	..	..	4 18 9
145,955	Telephone Co. of Egypt, 4½ % Deb. Red.	100	4½%	4½%	4½%	4½%	100½—102½	100½—102½	..	..	..	4 7 10
3,042	Submarine Cables Trust	Cert.	6 %	6 %	6 %	..	128 —131	128 —131	..	..	..	4 11 7
120,000	United River Plate Telephone	5	8 %	8 %	8 %	..	7⅛— 7⅞	7⅛— 7⅞	..	..	..	5 8 6
40,000	Do. 5 % Cum. Pref., Nos. 1 to 40,000	5	5 %	5 %	5 %	5 %	5 1/16 — 5 7/16	5 1/16 — 5 7/16	..	..	..	4 11 11
80,008	W. Coast of America, 1 to 80,000 & 58,001 to 58,008	2½	2½%	2½%	2½%	..	1 5/16 — 1 7/16	1¼ — 1⅜	..	..	— 1/16	4 10 11
150,000	Do. 4 % Debs., 1 to 1,500 guar. by Braz. Sub. Tel.	100	4 %	4 %	4 %	4 %	98½—100½	98 —100	..	..	— ½	4 0 0
207,980	Western Telegraph, Ltd., Nos. 1 to 207,980.. ..	10	7 %	7 %	7 %	..	13½— 14½	13½— 14½	13⅞	..	..	4 18 3
800,000	Do. do. 4 % Deb. Stock Red. ..	100	4 %	4 %	4 %	4 %	101 —103	101 —103	..	..	..	3 18 3
88,821	West India and Panama Telegraph	10	Nil	Nil	Nil	..	1¼— 1⅜	1¼— 1⅜	13/9	..	..	Nil
84,568	Do. do. 6 % Cum. 1st Pref.	10	6 %	6 %	6 %	..	8⅝— 9⅛	8⅝— 9⅛	8 3/16	..	..	6 9 9
4,669	Do. do. 6 % Cum. 2nd Pref.	10	Nil	£2 6	15 %	..	8 — 9	8 — 9	..	..	..	16 12 9
80,000‡	Do. do. 5 % Debs., Nos. 1 to 1,800 ..	100	5 %	5 %	5 %	5 %	100½—102½	100½—102½	102⅛	..	..	4 17 7

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.

640,000	Anglo-Argentine Trams, 5 % Cum. 1s Pref., 1 to 640,000	5	..	..	..	5 %	4 2/16 — 4 3/16	4 2/16 — 4 3/16	95/7½	92/6	..	5 2 7
500,000	Do. 5 % 2nd Pref., 800, to 1,300,000	5	..	..	..	5 %	4 5/16 — 4 7/16	4 5/16 — 4 7/16	86/3	..	..	5 9 7
4,465,674	Do. 4 % Deb. Stock ..	Stock	..	..	..	4 %	90 — 91½	90 — 91½	91½	90½	— ½	4 7 7
883,867	Auckland E. Trams, 5 % 1st Mort. Deb. Stock ..	100	5 %	5 %	5 %	5 %	105 —107	105 —107	..	..	..	4 13 5
880,000	Babcock & Wilcox, 1 to 880,000	1	20 %	20 %	20 %	24 %	5 5/16 — 5 7/16	5 5/16 — 5 7/16	5½	..	..	4 9 6
100,000	Do. do. 6 % Cum. Pref., 1 to 100,000 ..	1	6 %	6 %	6 %	6 %	1 1/16 — 1 1/16	1 1/16 — 1 1/16	..	..	..	8 19
60,000	British Aluminium, Ord., 1 to 40,000	5	7 %	7 %	Nil	..	..	..	..	..	..	Nil 6
50,000	Do. do. 7 % Cum. Pref.	5	7 %	7 %	3½%	..	..	..	..	..	..	..
40,100	Do. do. "A" 6 % Cum. Pref.	5	6 %	6 %	6 %	..	..	..	..	..	..	..
12,897	Do. do. 4 % Funding Certs.	5	4 %	4 %	2 %	..	..	..	..	..	..	..
124,400	Do. do. 5½ % Loch Leven Debs. ..	100	5½%	5½%	5½%	5½%	97 —100	97 —100	..	..	..	5 10 0
500,000	British Columbia E. Rail Def. Ord. Stock	100	6 %	8 %	8 %	8 %	142 —147	142 —147	145	148½	..	5 8 7
400,000	Do. Pref. Ord. Stock	100	5 %	5 %	6 %	6 %	123 —126	122 —126	..	..	..	4 8 11
400,000	Do. 5 % Cum. Perp. Pref. Stock	100	5 %	5 %	5 %	5 %	109 —112	109½ — 12½	111½	..	+ ½	4 9 7
223,000	Do. 4½ % 1st Mort. Debs., 1 to 6,250	40	4½%	4½%	4½%	4½%	102 —104	102 —104	..	..	..	4 6 7
212,600	Do. 4½ % Vancouver Power Debs., 1 to 2,900	100	4½%	4½%	4½%	4½%	102 —105	102 —105	..	..	..	4 5 9
188,301	British Electric Traction	10	Nil	Nil	Nil	..	⅜ — 1½	⅜ — 1½	17/6	16/3	..	Nil
161,497	Do. do. 6 % Cum. Pref.	10	6 %	8 %	1⅜%	..	2 5/16 — 3⅜	3 — 3⅜	65/-	58½	+ ½	4 11 0
1,473,553	Do. do. 5 % Perp. Deb. Stock ..	Stock	5 %	5 %	5 %	..	89 — 92	89 — 93	90½	87½	+ ½	5 7 6
528,986	Do. do. 4½ % 2nd Deb. Stock Red.	100	4½%	4½%	4½%	..	66 — 71	68 — 73	69½	68½	+ 2	6 8 3
100,000	British Insulated and Helsby Cables	5	10 %	10 %	10 %	10 %	6½ — 7	6⅝ — 7	..	..	..	7 2 10
100,000	Do. do. 6 % Cum. Pref.	5	6 %	6 %	6 %	6 %	5 15/16 — 6⅛	5⅞ — 6⅛	..	..	..	4 16 0
500,000	Do. do. 4½ % 1st Mort. Deb. Red.. ..	100	4½%	4½%	4½%	4½%	103 —106	103 —106	..	..	..	4 4 11
204,940‡	British Thomson-Houston 4½ % 1st Mort. Debs. ..	100	4½%	4½%	4½%	4½%	101 —104	101 —104	..	..	..	4 6 7
400,000	British Westinghouse 6 % Pref., 1 to 300,000 and 375,001 to 75,000	5	Nil	Nil	Nil	..	⅜ — ⅝	⅜ — ⅝	9/-	7/9	−3/16	Nil
1,316,353	Do. do. 4 % Mort. Deb. Stock ..	100	4 %	4 %	4 %	..	59 — 62	59 — 62	..	..	..	6 9 1
50,000	‡Browett, Lindley & Co., Ord.	1	Nil	Nil	Nil	..	3/16 — 5/16	3/16 — 5/16	..	..	..	Nil
50,000	Do. do. 6 % Cum. Pref.	1	Nil	Nil	Nil	..	14/6 to 15/6	14/6 to 15/6	..	..	..	Nil
140,976	Brush Electrical Engineering, Ord., 1 to 105,731 ..	2	Nil	Nil	Nil	..	0 — ⅛	0 — ⅛	..	..	..	Nil
200,000	Do. do. Non-cum. 6 % Pref.	2	Nil	Nil	Nil	..	0 — ⅛	0 — ⅛	..	..	..	Nil
125,000‡	Do. do. 4½ % Perp. Deb. Stock ..	Stock	4½%	4½%	4½%	4½%	39 — 44	39 — 44	..	..	..	10 4 8
125,000‡	Do. do. 4½ % Perp. 2nd Deb. Stock..	Stock	4½%	4½%	4½%	4½%	25 — 29	25 — 29	..	..	..	15 3 0
187,610	Calcutta Trams, 1 to 187,610	5	8 %	6 %	4½%	4½%	4⅛ — 4⅜	4⅛ — 4⅜	98/9	..	..	4 14 9
45,804	Do. 5 % Cum. Pref., Nos. 1 to 39,880..	5	5 %	5 %	5 %	5 %	4 — 5	4 — 5	97/6	..	..	5 0 0
350,000	Do. 4½ % 1st Deb. Stock..	100	4½%	4½%	4½%	4½%	98 —101	98 —101	..	..	..	4 9 1
35,000	Callender's Cable Construction shares	5	15 %	15 %	15 %	10 %	9⅛ — 10⅛	9⅛ — 10⅛	9⅛	..	..	4 17 7
40,000	Do. do. 5 % Cum. Pref.	5	5 %	5 %	6 %	5 %	5 — 5⅜	5 — 5⅜	..	..	..	4 13 0
800,000	Do. do. 4½ % 1st Mort. Deb. Stock Red.	Stock	4½%	4½%	4½%	4½%	102½—104½	102½—104½	..	..	..	4 6 9
491,229	Cape E. Trams., 1 to 491,229	1	Nil	Nil	Nil	..	¼ — ⅜	¼ — ⅜	..	..	..	Nil
450,000	Castner-Kellner Alkali, 1 to 450,000	1	8 %	12 %	12½%	12½%	2 3/16 — 2 5/16xd	2 3/16 — 2 5/16xd	54/6	..	..	4 7
910,158	Do. do. 4½ % 1st Mort. Deb. Stock	100	4½%	4½%	4 %	4½%	106 —109	106 —109	..	..	..	4 2 9
1,390 690	Central London Railway, Ord. Stock..	Stock	4 %	8 %	8½%	8 %	71 — 73	69 — 71	70½	69½	— 2	4 4 6
554,555	Do. do. 4 % Pref. Stock	Stock	4 %	4 %	4 %	4 %	86 — 88	86 — 88	88	87	..	4 10 12
554,555	Do. do. Def. do.	Stock	4 %	2 %	2½%	2 %	53 — 55	53 — 55	53⅛	..	..	3 12 1
1,480,000	City and South London Railway	Stock	3½%	2½%	1¼%	1⅞%	33 — 34	32½— 33½	33½	32⅞	— ½	5 4 6
5,000	Crompton & Co., Nos. 1 to 85,000	5	5 %	5 %	Nil	..	⅛— ¼	⅛— ¼	..	..	..	Nil
100,000‡	Do. 5 % 1st Mort. Reg. Debs., 900 of £100, and 901 11,000 of £50 Red	..	5 %	5 %	5 %	5 %	88 — 91	88 — 91	..	..	..	5 9 1

* Unless otherwise stated, all shares are fully paid. ‡ From Manchester Share List.

Continued on next page.

SHARE LIST OF ELECTRICAL COMPANIES.—(Continued.)

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.—(Continued)

Present Issue.	NAME.	Stock or Share.	Dividends for the last four years. 1906.	1907.	1908.	1909	Closing Quotations June 7th.	Closing Quotations June 14th.	Business done week ended June 14th, 1910. Highest	Lowest.	Rise + or Fall —	Present Yield per cent.
260,000	Dick, Kerr & Co., 1 to 260,000	1	10 %	10 %	6 %	..	1 1/16 — 1 3/16	1 1/16 — 1 1/16	..	..	..	£ s. d. 5 1 1
305,000	Do. do. 6 % Cum. Pref., 1 to 305,000	1	6 %	6 %	6 %	6 %	1 — 1 1/8	1 — 1 1/8	..	..	..	5 6 8
271,080	Do. do. 4½ % Deb. Stock	100	4½%	4½%	4½%	4½%	99 —102	99 —102	..	..	..	4 8 3
50,000	Dublin United Trams. (1896), 6 % Pref., 1 to 50,000	10	6 %	6 %	6 %	6 %	13 — 14	13 — 14	..	..	..	4 7 8
99,261	Edison & Swan Utd., "A" shs., £8 pd., 1 to 99,261	5	4½%	2½%	Nil	..	1/16 — 1/8	1/16 — 1/8	..	..	..	Nil
17,189	Do. "A" shares, 01—017,189	5	4½%	2½%	Nil	..	1 — 1 1/8	1 — 1 1/8	..	..	..	Nil
307,895	Do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	65 — 70	65 — 70	..	..	..	5 14 4
57,730	Do. 5 % 2nd Deb. Stock Prov. Certs. all pd.	100	5 %	5 %	5 %	5 %	79 — 82	79 — 82	..	..	..	6 1 11
112,100	Electric Construction, 1 to 112,100	1	Nil	Nil	Nil	..	1/4 — 3/8	1/4 — 3/8	7/6	..	..	Nil
31,890	Do. do. 7 % Cum. Pref., 1 to 31,890	1	7 %	7 %	7 %	7 %	1 1/16 — 1 1/8	1 1/16 — 1 1/8	..	..	..	9 0 8
25,000	General Electric Co. (1900), 5 % Cum. Pref.	10	5 %	5 %	5 %	..	7 1/2 — 8 1/4	7 1/2 — 8 1/4	..	..	..	6 1 8
200,000	Do. do 4 % Mort Deb.	Stock	4 %	4 %	4 %	4 %	82 — 86	82 — 86	..	..	..	4 13 0
78,000	Gt. N. & City Rail. Pref. Ord. "A" 4 %, 1 to 78,000	10	4 %	1 %	Nil	..	3/4 — 1	3/4 — 1	..	..	..	Nil
96,000	Greenwood & Bailey, 7 % Cum. Pref.	10	7 %	7 %	..	..	10 1/2 — 10 3/4	10 1/2 — 10 3/4	..	..	..	6 10 8
80,000	Do. do. 5 % Mort. Debs.	100	5 %	5 %	5 %	..	102 —103 1/2	102 — 103 1/2	..	..	..	4 16 10
40,000	Henley's (W. T.), Telegraph Works, Ord.	5	15 %	15 %	15 %	15 %	11 1/2 — 12 1/4	11 1/2 — 12 1/8	12 1/8	..	..	6 3 8
40,000	Do. do. 4½ % Pref.	5	4½%	4½%	4½%	4½%	5 — 5 1/8	5 — 5 1/8	..	..	..	4 3 9
150,000	Do. do. 4½ % Mort. Deb. Stock	Stock	4½%	4½%	4½%	4½%	103½—105½	103½ —105½	..	..	+ 1/2	4 5 4
50,000	India-Rubber, Gutta-percha & Telegraph Works.	10	10 %	10 %	10 %	10 %	14½ — 15½	14½ — 15½	..	..	..	6 10 1
57,500	†Liverpool Overhead Railway, Ord.	10	Nil	1/4	Nil	Nil	3/4 — 1 1/4	3/4 — 1	..	..	..	Nil
10,000	† Do. do. Pref., fully paid	10	5 %	5 %	5 %	5 %	5 — 5½	5½ — 5¾	..	..	..	9 1 10
600,070	London United Trams. (1901), 1 to 50,007	10	3 %	3 %	Nil	..	1½ — 2½	1½ — 2½	..	..	..	Nil
599,980	Do. do. 50,008 to 100,000	10	3 %	3 %	Nil	..	1½ — 2½	1½ — 2½	..	..	..	Nil
125,000	Do. do. 5 % Cum. Pref., 1 to 125,000	10	5 %	5 %	3 3/4%	..	2 — 2½	2 — 2½	45/-	..	— 1/4	15 0 0
1,649,980	Do. do. 4 % 1st Mort. Deb. Stock	100	4 %	..	4 %	4 %	67 — 71	67 — 71	68½	..	..	5 12 8
5,782,062	Metropolitan Consolidated	100	1 %	3/4%	3/4%	1 %	41 3/4 — 42 1/4	42 1/4 — 43	42 1/2	42	..	2 7 4
2,640,914	Do. Surplus Lands	100	2¾%	2¾%	2¾%	2¾%	66 — 68	66 — 68	66½	..	..	4 0 11
3,285,000	Do. District	100	Nil	Nil	Nil	Nil	23 1/2 — 23 3/4	23 1/2 — 23 3/4	23 5/16	..	..	Nil
391,337	Metropolitan Electric Trams., Ord.	1	..	..	4½%	..	2 3/4 — 2 15/16	2 3/4 — 2 15/16	..	..	..	5 15 0
314,016	Do. do. Defd.	1	Nil	Nil	Nil	..	1/16 — 1/8	1/16 — 1/8	1/10½	..	..	Nil
600,000	Do. do. 5 % Cum. Pref.	1	5 %	5 %	5 %	5 %	3/16 — 3/32	3/16 — 3/32	16/3	16/-	+ 3/32	5 14 3
595,600	Do. do. 4½ % Deb. Stock Red.	100	4½%	4½%	4½%	4½%	97 —100	98 —101	99½	..	+1	4 9 1
$10,823,200	Mexico Trams Co., Common Stock	..	..	..	..	..	128 —130	127 —129	..	..	—1	..
$9,000,000	Do. 1st Mort. 50-year 5% Gld. Bds.	..	..	..	5 %	..	97 3/8 — 98 3/8	98 1/4 — 99 1/4	99 1/4	98 1/2	+ 1/2	5 0 9
245,500	Potteries Electric Traction	1	4 %	4 %	Nil	..	3/16 — 1/4	3/16 — 1/4	..	..	..	..
245,500	Do. 5 % Cum. Pref.	1	5 %	5 %	5 %	5 %	3/16 — 1/4	3/16 — 1/4	11/-	10/9	..	6 17 11
245,000	Do. 4½ % Deb. Stock	100	4½%	4½%	4½%	4½%	82 — 85	82 — 85	..	..	..	5 3 6
37,350	Telegraph Construction and Maintenance	12	15 %	17½%	15 %	17½%	33 — 35	33 — 35	..	..	..	6 5 0
140,000	Do. 4 % Deb. Bds., 1 to 1,500 Red., 1909	100	4 %	4 %	4 %	4 %	100½—102½	100½—102½	..	..	..	3 18 1
1,000,000	Underground Electric Railway, 5% Prior Lien	..	..	..	5 %	..	100½—101½	100½—102½	101½	100⅜	..	4 18 6
2,800,000	Do. do. 4½% Bonds	..	..	..	4½%	4½%	89 — 91	89 — 91	90	89½	..	4 18 11
4,900,000	Do. do. 6% Income Bonds	..	..	..	..	..	38 — 40	37 — 39	..	..	—1	..
66,666	Willans & Robinson, 1 to 80,000 & 80,001 to 116,666	1	Nil	10 %	5 %	Nil	1/8 — 3/16	1/8 — 3/16	..	..	..	..
66,666	Do. 6 % C.P., 80,001 to 80,000 & 126,001 to 141,666	5	..	6 %	6 %	3 %	1½ — 1¾	1½ — 1¾	..	..	— 1/4	8 11 5
245,495	Do. % 1st Mort. Deb. Stock		4 %	4 %	4 %	4 %	60 — 70 xd	60 — 70	..	..	..	5 14 4

ELECTRICITY SUPPLY COMPANIES.

80,449	Brompton & Kens. Elec. Lt. Sup., Ord., 1 to 20,000	5	10%	10 %	10 %	10 %	7½ — 7¾	7½ — 7¾	..	..	..	6 9 0
9,551	Do. do. 7 % Cum. Pref.	5	7 %	7 %	7 %	7 %	7 — 7½	7 — 7½	..	..	..	4 13 4
400,000	Central Electric Supply 4 % Guar. Deb. Stock	100	4 %	4 %	4 %	4 %	98 —101xd	98 —101	..	..	..	3 19 3
80,000	Charing Cross and Strand Electricity Supply	5	5 %	5 %	5 %	5 %	3 3/4 — 4 1/4	3 3/4 — 4 1/4	..	..	— 1/8	5 17 8
80,000	Do. do. do. 4½ % Cum. Pref.	5	4½%	4½%	4½%	4½%	4 1/4 — 4 3/8	4 1/4 — 4 3/8	87/6	86/3	..	4 17 4
80,000	Do. "City Undertaking" 4½ % Cum. Prf.	5	4½%	4½%	4½%	4½%	8 7/8 — 9 1/8	8 3/4 — 9	..	..	..	5 2 10
445,736	Do. do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	97 —100	95½ — 97½ xd	..	..	..	4 0 0
49,486	Chelsea Electricity Supply, Ord.	5	4½%	4½%	4½%	4½%	8 5/8 — 8¾	8 5/8 — 8¾	..	..	..	5 9 1
175,000	Do. do. 4½ % Deb. Stock Red.	Stock	4½%	4½%	4½%	4½%	101 —103	101 —103	..	..	..	4 7 5
70,595	City of London Elec. Lighting, Ord. 40,001—110,596	10	6 %	6 %	6 %	7 %	11 1/2 — 11 3/4	11 1/2 — 11 3/4	11 7/16	11 5/16	..	5 19 2
40,000	Do. 6 % Cum. Pref., 1 to 40,000	10	6 %	6 %	6 %	6 %	12 — 13	12 — 13	..	..	..	4 12 4
400,000	Do. 5% Db. Stk.	Stock	5 %	5 %	5 %	5 %	121 —125	121 —125	..	..	..	4 0 0
200,000	Do. 4½ % 2nd. Db. Stk.	100	4½%	4½%	4½%	4½%	100 —103	100 —103	..	..	..	4 7 5
50,000	County of Durham Electrical Power, Ord.	5	4 %	2 %	Nil	Nil	1½ — 2	1½ — 2	..	..	..	5 0 0
50,000	Do. do. do. 6 % Pref.	5	5 %	5 %	5 %	5 %	2 3/4 — 3 1/4	2 3/4 — 3 1/4	..	..	..	7 13 10
350,000	Do. do. do. 5 % 1st Mtg. Deb.	Stock	..	..	5 %	5 %	94 — 96	94 — 96	..	..	..	5 4 2
40,000	County of London Electric Lighting, Ord. 1—40,000	10	5 %	5 %	5 %	5 %	7 1/2 — 8	7 1/2 — 8	..	..	..	6 5 0
55,000	Do. do. 6 % Pref., 40,001—60,000	10	6 %	6 %	6 %	6 %	10 3/8 — 11 3/8	10 3/8 — 11 3/8	11 1/8	10 15/16	..	5 15 8
400,000	Do. do. 4½ % Deb. Stock	Stock	4½%	4½%	4½%	4½%	105 —108	105 —108	107½	..	..	4 3 4
400,000	Do. do. 4½ % 2nd. Deb. Stock	Stock	4½%	4½%	4½%	4½%	98 —101	98 —101	100	..	..	4 9 1
80,000	Edmundson's Electric Corporation, Ord. Shares	5	Nil	Nil	Nil	..	1/16 — 1/8	1/16 — 1/8	..	..	..	Nil
60,000	Do. do. 6 % Cum. Pref.	5	3 %	Nil	Nil	..	1 1/16 — 1 1/8	1 1/16 — 1 1/8	..	..	..	Nil
480,500	Do. do. 4½ % 1st Mort. Deb. Stk.	100	4½%	4½%	4½%	..	74 — 77	74 — 77	..	..	..	5 16 11
$8,150,000	Electrical Dev. Co. of Ontario, 5% 1st Mtg. Gold Bnds.	$500	..	..	5 %	5 %	82½ — 85½	86 — 89	87½	85½	..	5 12 4
10,000	Folkestone, 1 to 10,000	5	5%	5%	5%	5%	4 1/2 — 4 3/4	4 1/2 — 4 3/4	..	..	..	5 15 9
10,000	Do. 5 % Cum. Pref., 1 to 10,000	5	5 %	5 %	5 %	5 %	5 — 5½	5 — 5½	..	..	..	4 10 11
90,000	Do. 4½ % 1st Deb. Stock	100	4½%	4½%	4½%	4½%	101 —104	101 —104	..	..	..	4 6 7
15,000	Hove, 1 to 15,000	5	9 %	8¾%	8¾%	8¾%	7 — 7½	7 — 7½	..	..	..	5 18 4
$1,875,000	Kaministiquia Power Co., 5 % Gold Bnds.	100	..	..	5 %	5 %	102 —104	102 —104	103½	..	..	4 16 2
21,000	Kensington and Knightsbridge Electric Ord.	5	10 %	10 %	8 %	8 %	6 3/4 — 7 1/4	6 3/4 — 7 1/4	..	..	..	5 10 4
90,000	Do. do. do. 4 % Deben. Stk.	Stock	4 %	4 %	4 %	4 %	94 1/2 — 96 1/2	94 1/2 — 96 1/2	..	..	..	4 2 11
111,000	London Electric Supply Corporation, Limited, Ord.	3	4 %	2½%	3 %	..	1 3/8 — 2	1 3/8 — 2	37/6	..	..	4 8 11
70,000	Do. do. do 6 % Pref.	5	6 %	6 %	6 %	..	4 1/2 — 5 1/4	4 1/2 — 5 1/4	97/6	..	..	5 14 3
882,855	Do. do. 4 % 1st Mort. Deb. Stk. Red.	Stock	4½%	4½%	4 %	4 %	92 — 94	90 — 92 xd	..	..	..	4 0 7
200,000	Metropolitan Electric Supply, 1 to 100,000	5	8 %	6¾%	5 %	5 %	3 3/4 — 4	3 3/4 — 4	72/6	..	..	6 5 0
76,121	Do. 4½ % Cum. Pref. 1—71,106	5	4½%	4½%	4½%	4½%	4 1/2 — 4 7/8	4 1/2 — 4 7/8	96/3	..	..	4 12 4
285,000	Do. 4½ % 1st Mort. Deben. Stock	Stock	4½%	4½%	4½%	4½%	104 —107	104 —107	..	..	..	4 4 1
248,000	Do. 5% Mort. Deben. Stock Redem.	Stock	5%	5%	5%	5%	83 — 86	83 — 86	84	..	..	4 1 5
$6,000,000	Mexican Electric Light Co., 5% 1st Mtg. Gold Bnds	100	5 %	5 %	5 %	..	85 — 86	86 — 87	..	..	+1/2	5 14 11
18,585,000	Do. Light and Power Co., Ltd., Common	$100	..	..	3½%	..	80 — 82	80 — 82	81	..	..	4 5 4
$2,400,000	Do. do. 7% Cum. Pref. Stk.	Stock	..	..	7 %	7 %	103 —105	103 —105	104	104½	..	6 13 4
12,000,000	Do. do. 5% 1st Mtg. Gold Bnds.	100	..	..	5 %	5 %	90 — 91	91 — 92	92	91⅛	+1	5 8 8
260,000	Midland Electric Corporation, 4½ % 1st Mort. Deb.	100	4½%	4½%	4½%	4½%	97 — 99	97 — 99	..	..	..	4 10 4
180,491	Newcastle-on-Tyne, 1 to 187,500	5	8 %	8 %	2½%	..	4 1/8 — 4 5/8	4 1/8 — 4 5/8	..	..	..	2 14 0
187,500	Do. 5 % Pref., 1 to 187,500	5	5 %	5 %	5 %	5 %	4 1/8 — 4 1/4	4 1/8 — 4 1/4	..	..	..	5 2 7
196,500	North Metropolitan Electric Power Supply Co., 5 % Mortgages (Red.), Nos. 1 to 1,965	100	..	..	..	5 %	99 —101	99 —101	99⅜	99½	..	4 19 0
16,852	Notting Hill Electric Lighting	10	7½%	7½%	7 %	..	11 1/2 — 12 1/4	11 1/2 — 12 3/4	..	..	..	5 9 10
20,000	Oxford, 1 to 96 and 407 to 20,310	5	7 %	7 %	7 %	7 %	6 1/4 — 7	6 1/4 — 7	..	..	..	5 0 0
119,694	River Plate Elcty. Co. Ord. Nos. 1 to 120,507	1	2½%	6 %	8 %	9 %	2 1/8 — 2 5/8	2 1/8 — 2 5/8	45/-	..	..	3 17 10
100,000	Do. do. 6% Non Cum. Pref. Nos. 1 to 100,000	1	6 %	6 %	6 %	6 %	1 3/8 — 1 3/4	1 3/8 — 1 3/4	..	..	..	4 19 0
200,000	Do. do. 5% Deb. Stk. Red.	100	5 %	5 %	5 %	5 %	103 —105	103 —105	..	..	..	4 15 3
40,000	St. James' and Pall Mall Electric Light, Ord.	5	10 %	10 %	10 %	10 %	8 3/4 — 8 7/8	8 3/4 — 8 7/8	8 1/2	..	..	5 15 11
80,000	Do. do. 7 % Pref. 20,081 to 40,080	5	7 %	7 %	7 %	7 %	6 3/4 — 7 1/8	6 3/4 — 7 1/8	7	6 7/8	..	4 14 11
150,000	Do. do. 3½ % Deb. Stock Red.	100	3½%	3½%	3½%	3½%	86 — 88	86 — 88	..	..	..	3 19 7
12,000	Smithfield Markets Electric Supply, Ord.	5	Nil	Nil	Nil	..	1 1/2 — 2	1 1/2 — 2	..	..	..	Nil
65,000	South London Electric Supply, Ord.	4	3 %	4 %	5 %	5 %	2 1/2 — 3	2 1/2 — 3	..	..	..	6 9 0
180,100	Do. do. 5 % 1st Mort. Deb.	100	..	..	5 %	5 %	101 —104	101 —104	..	..	..	3 16 11
120,000	South Met. Elec. Lt. & Power, Ord.	1	2½%	2½%	2½%	..	1/2 — 5/8	1/2 — 5/8	..	..	..	5 0 0
142,968	Do. do. 7 % Pref.	1	7 %	7 %	7 %	7 %	1 — 1 1/8	1 — 1 1/8	..	..	..	6 4 5
234,520	Do. do. 4½ % 1st Deb. Stk.	100	4½%	4½%	4½%	4½%	98 —101	98 —101	..	..	..	4 9 1
80,000	Urban Electric Supply, Ord.	5	5 %	5 %	5 %	..	1/4 — 1	1/4 — 1	..	..	..	10 0 0
50,000	Do. do. 5 % Cum. Pref.	5	5 %	5 %	5 %	..	2 — 2½	2 — 2½	..	..	..	10 0 0
275,000	Do. do. 4½ % 1st Mort. Db. Stk. Red.	100	4½%	4½%	4½%	4½%	79 — 81	79 — 81	..	..	..	5 11 1
608,000	Victoria Falls Power Co., Pref. Nos. 1 to 608,000	1	..	..	5 %	..	3/8 — 7/8	3/8 — 7/8	..	..	..	5 14 3
100,00	Westminster Electric Supply, Ord.	5	12 %	10 %	10 %	10 %	8 3/4 — 8 5/8	8 3/4 — 8 5/8	8 1/2	..	..	5 15 11
51,279	Do. do. 4½ % Cum. Pref. Reduced from 5% since 31st Dec., 1905)	5	4½%	4½%	4½%	4½%	5 — 5½	5 — 5½	..	..	..	4 1 10

* Unless otherwise stated, all shares are fully paid. † Quotations on Liverpool Stock Exchange.

Debate on the Effects of Free Trade or Protection upon the Electrical Industry.

(*Concluded from page* 944.)

Mr. Bruce Anderson: I feel that I owe an apology to this meeting for my absence from the last meeting after having expressed a desire to speak. Had I known that I should have been called upon to speak, I should have sent an apology to the chairman for my absence. I am not at such a great disadvantage as I should have been, and I am obliged to the professional Press for the full report of the speeches of Mr. Kingsbury and Mr. Hirst. With regard to the latter I have nothing to say beyond this that I agree with it entirely, except, perhaps, in the opening. Although I admire the felicity of the language in which Mr. Hirst congratulates Mr. Kingsbury, I do not find myself able to re-echo these congratulations, and I will tell you why. But first I should like to remember a piece of advice I once heard or read of, which was if you are going to quarrel with a man, first find out the points on which you are agreed, and then when you have eliminated those you may find that there is not so much to quarrel about after all. Well, I have read Mr. Kingsbury's speech not once, nor twice, but several times, and I have searched conscientiously for some point of agreement, and I have found one, and one only, and that one, perhaps, Mr. Kingsbury will pardon me for quoting from memory. He says this: "I do wish if it were possible that we could get to a more reasonable attitude on this question of foreign trade." Well, I wish precisely the same thing, and if Mr. Kingsbury will permit me I will act upon it and hope, in my opinion, he may be more reasonable on this question of foreign trade. This meeting was called for the purpose of discussing the effect of the fiscal policy of the country upon the electrical industry. Mr. Kingsbury, I presume, accepted the invitation to propound the Free Trade opinion. I say not only has he completely failed to do so, but he makes no attempt to do so. At the very outset he says that you must look at the good of the nation as a whole, and therein you will find the good of the electrical industry. Now, it has been said that no man can be a good citizen of the world if he is not a good citizen of his own country, and I go further, and say that no man can be a good citizen of his own country if he is not a good citizen to his own industry. It appears to me extraordinary that Mr. Kingsbury throws out the suggestion that the Tariff Reformer is going to make the mistake of seeking the good of his own industry in contradistinction to that of his country, and it is a suggestion that I should very much resent. Mr. Kingsbury makes that suggestion, and upon that suggestion must be superimposed his ideas that the interests of the electrical industry, and the interests of the nation as a whole, are identical under Free Trade. If that is so, is it not extraordinary that a man of Mr. Kingsbury's long and wide experience of the electrical industry is unable to give one single practical illustration of where they coincide—not one? And I believe that the reason why he does not is because he cannot. I pass from the narrow platform of the electrical industry to the broader ground of the nation's interest, where Mr. Kingsbury, for some inscratable reasons, feels more at home, and in seeking to find one point in his speech on which to fix—because I have only time for one—I am particularly attracted by one paragraph, because it is one in which he calls a spade a spade. I should have expected that in such a speech a spade would have been called an agricultural implement used for the tilling of the ground by a hind thereon, and only found in perfection in a Free Trade country. But, as a matter of fact, Mr. Kingsbury does correct himself afterwards, and says he only calls it a spade metaphorically. But what does he say about the spade? He says we think too much of the profits of the spade and too little of the potential profits on agriculture. I am quoting from memory.

Mr. Kingsbury: That is right.

Mr. Anderson: I am not here to consider what might happen. I am not here to accept as certain that which, theoretically, should happen, because I know what does happen. Let us see what happened to the spade and agriculture. Let us take Germany, because of all our great rivals her agricultural population is the smallest. Fifty years ago the agricultural population of Germany was 2,000,000, and to-day it is 10,000,000. It is one of the finest markets for spades in the world, and the Germans take jolly good care to make them. Fifty years ago the agricultural population of this country was also 2,000,000, and to-day it is 1,000,000, and we make very few of the spades. Can Mr. Kingsbury point to any country in the world where the protection of spades or any other industry has been to the detriment of agriculture? Can he point to this country and say that the free importation of spades or any other article has been the salvation of industry? He cannot. But I go further. I was in Russia recently, and, like a selfish manufacturer, I was looking round to see if there was anything to be got, and I found there was not. I asked gentlemen there what would do in Russia, and they told me agricultural implements. I asked who was doing the business, and was told the Germans. The Government of Russia has found money, or rather it is finding bonds, in order that the Germans may find the money to supply agricultural implements all over Russia on easy terms, and I was told in that conversation that Germany is doing all the trade because she has a depôt in every country town throughout Russia, and she is able to offer no less than 700 different patterns of ploughs to meet the Russian market. It does not seem that Protection has done her spade-making any harm. It has not done her agriculture any harm, and can we show anything like it in this country? After this brief glance into the world of things as they are, I come back to our own country, and what do I see? Mr. Garcke has told you that the unemployment in this country is greater than in any other country from which we have returns, and if anyone wishes to controvert that I hope he will be fair, and give periods of years for a country, and not tell us of New York at some time of particular strain as representing America. Unemployment in this country is greater, but the only returns we have are Trade Union returns. Trade Unionists number one-tenth of our working population, and amongst the other nine-tenths the unemployment is appalling, and no honest-minded man who keeps his eyes open can deny it. And on top of that, we are told on the best authority that we have 12 millions of people living on the borders of starvation. And on top of that, again, we have exported in the last 10 years over two millions of the most virile of our people, who are the people who won't bow their neck to this yoke of unemployment. These are the calamitous evils for which our Free Trade friends have no remedy, and seek none, and if you put it to them their cry is *laissez faire*, and that we are getting richer every day. If these are the conditions necessary for the accretion of our wealth, then I say it is time for us to begin to get poorer. Tariff Reformers hold no such belief; we know that we can get richer and get stronger to feed and employ our own people. The electrical industry has in it a body of men, increasing, I think, in its numbers every day, far-sighted and practical men who believe in Tariff Reform. We have another body of men of a more academic turn of mind, and I hope a lesser body of men who are looking backward to the time when the theories which they expound to-day had some possible basis of truth. We may have—I hope not and think not, but we may have—others who are obsessed by the frankly cynical and selfish doctrine of the Manchester school, but I think that whether we be Free Traders or whether we be Tariff Reformers, we in the electrical industry must at least say this of one another, that we shall never agitate for Protection against the ultimate interests of any section or any class of our own fellow-countrymen, but as Tariff Reformers, what we will agitate for, and what we shall most assuredly obtain, is a fair field against our foreign competitors. When that fair field is obtained, self-depreciatory as Mr. Kingsbury may think us, we shall not be afraid of the result, and in my considered and convinced opinion that fair field can only be obtained and will be obtained, by Tariff Reform.

The Chairman: At this late hour, I am afraid it is impossible for us to listen to any more speeches, and we must now content ourselves with listening to the replies to be given by the openers of the debate. I should, however, just like to say that the success of this meeting has been so great, that it has determined our energetic secretary to organise, at an early date next winter, further discussions on possibly this or similar subjects which are of equal interest to the electrical manufacturing industry.

Mr. Kingsbury: Mr. Chairman and gentlemen, I would just like to know whether I can be heard on the outskirts of this meeting. If I find it impossible to keep my voice up at this pitch I can take a hint, and if anyone says "Speak up" I will try to do so. Now, Sir, this discussion has covered very wide ground, and it is impossible for me to go over it entirely. I wish I had time and you had the patience, for it is just exactly what I should like to do. I should like to comment *seriatim* on the whole discussion. But the tendency of several speakers, although there are exceptions, has been generally to depart from the lines on which we started our discussion, and to bring in all sorts of side issues, such as Mr. Anderson did, who has just now sat down. Mr. Anderson must know that unemployment is not a matter which depends upon Free Trade, or can be cured by Protection. It is a social question which requires most careful examination, and the Tariff Reformer who says that "Tariff Reform means work for all" is either taking a very narrow view of the subject, or——. Many other things which have been mentioned to-night I shall, in the course of my reply to Mr. Hirst, deal with, but specific points have been raised for me by Mr. Garcke and Mr. Byng. Mr. Garcke says that the idea of Free Traders that imports are paid for by exports is all wrong. Now, Free Traders do not all say that imports are specifically paid for by some definite export. One of the most eminent Free Traders we have is Sir Felix Schuster. He says, "I cannot absolutely subscribe to the theory that every import of goods must, of necessity, imply an export of goods. It must imply an export of something, which may be an export of earning power, either by the sale of foreign investments hitherto held here or by foreign capital being invested in our home securities. About such processes there are absolutely no statistics, and we can only judge from observation of the facts that come before us. It has been asserted by some that if paid for by sales of investments, part of the excess of imports has been paid for out of capital; but this theory is entirely misleading." Then Mr. Garcke asked me if I would tell him how competition can be regulated except by means of a Tariff. Now, the regulation of competition is a very difficult thing, but to be prepared for competition is a matter of great easiness. All you have got to do in order to be able to compete is to be efficient. Then Mr. Garcke has not taken my advice. I asked you all to think of these trade questions in terms of earth circuits; but Mr

Garcke has put before you an argument which is absolutely opposed to that principle. He says you do not sell so much to certain countries as you buy of them. Do any of you gentlemen in your business buy as much from the man you sell to as you sell to him? Of course not; nor need we as a country. Then Mr. Byng says, will I tell him what materials he can buy cheaper than his competitor in a foreign country? If Mr. Byng had given me notice of this question—as they say in another place—I would have given a pretty long list, but there are two that I have in my head, and I will tell him that he can buy his copper wire 12 fr. per 100 kilos. cheaper here than his competitor in Paris. I can tell him that he can buy lead £5 16s. 8d. per ton cheaper in London than his American competitor. I regret that I have not had notice of this question, or I could have multiplied these examples.

Mr. Byng: I said copper—not wire that is got from the factories.

Mr. Kingsbury: Unless Mr. Byng draws his own wire, the price of copper is nothing to him. His raw material—at least I assume so—is copper wire. Now I come to the last meeting; the first speaker on that occasion was Mr. Raworth, and Mr. Raworth told you that 90 per cent. of the tramway material of this country came from America. I was rather startled with that statement, and I asked some friends of mine, who knew the business pretty well, what they thought it would be. One said it could not be more than 5 per cent.; another gave me a more modest figure. You will see that there is a discrepancy between those two figures, which implies that the information we get on this question, that is not the subject of cross-examination, is not of very great value. But I have this information, which I believe to be precise, that in a large tramway system constructed within the last 10 years, there is not a particle of electrical material from abroad—in other words, England can supply all the tramway material that is required. Then Mr. Raworth told us about a company for which some friends of his subscribed the capital for an electrical business, and had it returned. I don't know whether it is the same, but I have no doubt it is, because I don't think there was more than one; I have with me a report of the meeting at which that money was returned, and I will read you two paragraphs from the chairman's speech at that meeting, because they cover two very essential points. They show that when Mr. Raworth mixes up Free Trade with that question, he is just mixing up something that does not apply at all:—

The Chairman, after referring to the circumstances of the time when the company was established, observed "that a Bill had been brought into Parliament hampering the electric light most seriously, imposing the most vexatious restrictions and regulations. One was that if the light were a success the authorities could take it over at the expiration of 14 years, which was afterwards, he believed, extended to 20 years; but if it were not a success, the company undertaking it had to bear the loss. Had such legislation been determined on as regarded gas, he believed we should still be using oil. The Bill passed last year had, he contended, done more than anything else to prevent the electric light from competing with gas. The result of all the electric light companies starting was excessive competition. The universal offer was the electric light at the price of gas, but he maintained that that could not be done; at least no system, at any rate, of incandescent lighting with which they were acquainted at the present moment could show that it made a profit commensurate with the risk run. He could quite conceive that a well-managed company manufacturing its own plant, and not overburdened with money expended on the purchase of patents, might pay its way and keep going, but more than that he would not allow. Of course they would understand that these remarks applied only to the present position in connection with the electric light." He then went on to say, "He could understand that the electric light could be produced at a very considerable profit at New York and on the Continent, where gas was two or three times as dear as it was in this country."

That meeting, gentlemen, was held in 1883, and you get from it the facts that the Electric Lighting Act had a distinctly retarding effect on the electrical industry, and that the demand did not then exist in such a way as would justify the employment of the capital, which was, in fact, returned to the shareholders. Mr. Raworth asked me whether I call that Free Trade. What has such a question of internal government got to do with the Free Trade we are discussing? Nothing whatever, except that the ill-considered protective measure, which you now know has resulted in serious harm, had the same authorship as those other protective proposals which we are now considering, and which you want to swallow with such avidity. Now I come to Mr. Hirst's speech, and Mr. Hirst and myself have agreed that we are going to say just what we like about one another. I think it right to tell you that, because I am going to say some hard things about Mr. Hirst, and I have no doubt he will say some hard things about me. He tells you that you want to take this measure while you can get it with the goodwill of the nations. (Hear, hear.) There is a gentleman who says "Hear, hear," and I am sorry. I do not agree with him, and I say if you want to do it now, do it. If you want to do it later on, do it, and pay no attention to the goodwill of the nations. I suggest that you do not suffer any danger at all from any nation if you simply do what you consider to be the best for yourselves. If Mr. Hirst's idea is correct that our foreign competitors will feel aggrieved if we let them go on selling to us and then stop them; if, in fact, they conclude they are entitled to have an unlimited licence, then I suggest that the case might be met by putting a notice in the *London Gazette*, and telling them that they must not think anything of the kind. If we want to do it, let us do it; if we do not want to do it, don't let what other nations think influence us in any way. We can take care of ourselves. Then I come to the subject of cotton, and if there is one thing in this world I do not know anything about it is cotton. I do not believe that Mr. Hirst knows much more, and you very naturally wonder why the two of us should come here and occupy your time in talking about something we do not know anything about. However, Mr. Hirst has used some arguments in regard to cotton. He has suggested that the cotton operatives are using an unfair advantage with their numbers, and he practically sets class against class, so to speak, by indicating that electrical interests should combine with others against the cotton interests. He told us there are 23,000 fewer cotton operatives than there were at some other date—I forget when. I have looked at the figures, and I don't find that there is any less raw cotton bought or less cotton manufactured over the period to which Mr. Hirst referred. If it be a fact, it seems to me that it may be taken in a contrary sense to that in which Mr. Hirst takes it. It may be taken as showing that the cotton spinners know their business very well. If they are turning out the same quality, and larger quantities, with 23,000 less operatives, then I think they are doing pretty well. Mr. Hirst is concerned about the cotton industry. He is a little anxious as to whether it is in quite a healthy state, but I want to relieve his anxieties. I had a few days ago a copy of one of the most influential papers across the Atlantic, and they were doing a little grumbling, and they said, "We ought to clothe the Orient, especially when we grow the cotton, but Lancashire retains its primacy." So I think we can go to sleep to-night on that. And then Mr. Hirst, I confess, somewhat unwisely considers that the cotton industry and the electrical industry are not just on parallel lines, as they should be. Now I have no doubt myself that electrical driving of cotton mills is bound to come. I have not any doubt. Mr. Raworth has told us that Lancashire men are fine fellows. I believe they know their business, and I believe electrical driving is certain to come, but I believe it will come the sooner if you treat the cotton manufacturer of Lancashire as if he did know his own business. Then Mr. Hirst defines the industry that we are talking of. My conception of the industry was wider than his, but my conception of the benefits of Free Trade does not depend on any limitation whatever. It is of more importance to the manufacturing industry—which I take it Mr. Hirst represents—than to the rest. Mr. Garcke, I think it was, talked about Free Trade as a religion, but I am not here to talk religion. I am here to talk business. How are we to deal with any question of business without first of all taking into consideration facts; drawing deductions from those facts and arguments on those facts? That is what I am going to do, and with a view to reaching a conclusion I am going to examine Mr. Hirst's facts, his arguments, and his deductions. Now, first, the history. What I would like to know is why 1880 is selected as an epoch-marking event in the history of England's commerce? In old days we used to take history by the periods of reigning monarchs. Then a more sensible system came along in which some important epoch was taken. I suppose it is a variant of that more satisfactory system which now permits anybody to pick out of history any date he likes, but I undertake to say that if any chartered accountant were called in to examine the books of Great Britain, Ltd., he would not put his finger upon 1880 as having anything special about it. It is a purely arbitrary selection. Our business was in a sound position in 1880, and is in as sound a condition to-day as ever it was. Then Mr. Hirst sets out on what I may call the depreciation of Free Trade, and he told you that our prosperity is not due to Free Trade. He says "it so happened that the introduction of Free Trade in this country tallied with the development of steam as a power to reduce the cost of production," and he implies that the progress was by steam, in spite of Free Trade. Now the first cotton factory to be driven by steam was in the year 1785, and the Liverpool and Manchester Railway was opened in 1830. What was the invention or new development that took place in 1846? I am not learned in the history of engines, but if there had been any large development or any important invention in connection with the steam engine and manufactures in 1846, I believe I should have heard something about it. Now, what is the reasonable inference? No Free Trader says that Free Trade will make people prosperous without using their energies. Nobody says you can make a country prosperous without using the best means possible to attain prosperity, but is it not a reasonable inference to say when you find that Free Trade and steam ran along parallel together, that the development of the steam resulted from the freedom of trade, rather than to say that the freedom of trade only acted as a bar to the full development of steam? I can imagine, Sir, Mr. Hirst driving along the Thames Embankment and seeing a barge floating down the stream and telling his friends that "it so happened" that the barge and the stream were going in the same direction. I have prepared myself with some quotations from the records of the period, but I feel sure you won't call upon me to produce them. I come now to Mr. Bennett Fitch. I have not left Mr. Hirst, but this is a suitable time to bring in Mr. Bennett Fitch, because he was great on history, and he told us that the hunger of the forties was not due to scarcity of food, but to the superabundance of machinery, and he quoted an extract from a German encyclopædia, which was written with candour, and with a greater brevity than is usual in that kind of production in that part of the world. But, Sir, I am not reflecting on the compiler of the encyclopædia; I think he wrote a fair and honest statement about England; and I do not consider it necessary to ask the date of compilation of the encyclopædia, which is sometimes considered an important point. What the writer said was true a hundred years before, and it will be true a hundred years afterwards, except for details, if the policy of Free Trade in this country, and the liberty of the subject which is essentially referred to, is maintained. But what I do want to know is, why a gentleman who has

acquired a name as an engineer, will take a solitary item from a German encyclopædia and deduce from it the inference that he did, when material is at his elbow which will give him actual facts, and tell him something about them. I dare say some of you gentlemen will remember Mr. Bennett Fitch's statement at the last meeting. Now, I want you to listen for a moment while I read a somewhat lengthy extract from a contemporary record which was written in England. It is an extract from the *Times* of the last day of the year 1853, and is as follows: "Experience has well taught us what a scarcity of corn means under a system of Protection, or Prohibition. Incendiary fires, Chartist meetings, frame breaking, and every form of rural and suburban outrage are the methods by which a people pinched for bread by unjust and unequal laws speaks to the conscience and fears of its rulers. They not only feel the effect, but they bitterly resent the cause. Let those who lament over the fate of bygone restrictions carefully consider what has happened in the present year. While almost every Government in Europe has stood in abject dread of its own subjects, and condescended to devices the most discreditable in order to seem at least to palliate the severity of that famine for which they themselves have taught the people to hold their Government responsible—while we see prohibitions abrogated, exportation prohibited, and artificial prices created by Governments proud of their strength, and careless, in ordinary times, of their popularity, our Ministers have been wisely content to leave the remedy of scarcity to the operation of demand and supply, and to trust to the good sense of a free people to distinguish between a scarcity caused by the act of an all-wise Providence and by the blind and short-sighted meddling of man. Never was confidence more justly reposed or more fully repaid. The people of these islands, heretofore so turbulent at the approach of scarcity, have borne their privations without a murmur, and it has been satisfactorily proved that, by the repeal of the Corn Laws, Government has for ever emancipated itself from the unpopularity which used to follow a bad harvest, and effectually removed one of the most prominent and frequently-recurring causes of discontent and sedition." Now, gentlemen, I will tell you why I have dealt with that subject somewhat fully. Anyone who has been engaged in manufacture in this country in a large way, as has been my experience, must know that the prejudice of workmen against the use of labour-saving machinery has not yet entirely gone, and I must confess that it struck me as a matter of importance that such an impression as was left on our minds at the last meeting should be sufficiently demonstrated to be wrong. I consider that it is my business to point out to the workmen that they have no fear to use labour-saving machines. History tells us that every machine which reduces work increases demand as well as production and the employé is not injured. That is an important matter, and I think it cannot be too widely dwelt upon that it is our policy to inculcate such principles as that rather than for the sake of a partisan principle to make a point on such a question as this—what I want to say is that such a method of promoting Protection can do nothing but harm to the cause. I now come to some points upon which I think we are entitled to have from Mr. Hirst some definite information. I come to electrical facts, and he says it is a fact that nearly every electrical invention originated in this country until 1884 or 1885. Now "nearly every electrical invention" is a pretty wide statement. We had our share, as I pointed out in my opening remarks, but surely it would not be assumed to cover the whole ground. There is such a thing as the telephone, which I have always understood was invented in America. Those of us who were not so intimately connected with the accumulator business as Mr. Hirst were under the impression that Lord Kelvin found his magic box, which illustrated the conservation of energy, in Paris; and I was certainly under the impression that France had made a very considerable contribution to electrical inventions, when Gramme invented his dynamo. How, then, can we say that nearly every invention of the electrical world emanated with us? I don't want for one moment to depreciate our achievements—far from it; I only want to get the facts. In pursuance of the policy of proving that Free Trade has done us harm, it is unfortunate, but it is nevertheless a fact, that Mr. Hirst puts our achievements upon a pinnacle, and it is necessary to pull them down. Mr. Hirst says that the arc lamp industry, transformers, &c., all were developed in this country. My idea was that the first lamp that came here bore the name of Jablochkoff—that does not sound very English. Others bore the name of Rapieff and Werdermann, and they were followed by the Brush, the Pilsen and the Weston. The fact is that the English contribution to the lamp development was more important in the 'fifties than in the very early 'eighties. Has Russia maintained her early lead? Does France trouble you with her exports? We don't find anybody saying that Free Trade has ruined the electrical industry of Russia, notwithstanding their improvement in the early days. I have never yet heard anybody say that Free Trade has ruined the electrical industry of France. Why is it that the electrical industry of England is always looked upon as the victim of Free Trade? Mr. Hirst contends—and I fear that it will not be possible for me to go *seriatim* through all his observations on this particular point—but I will say this, that I don't think that there is a single statement that Mr. Hirst makes regarding the electrical industry that is not either incorrect in itself, or may reasonably be read in an incorrect way. I have not time to go through them, but if anybody wants to put me to the challenge, and will ask me the question, I will take it up. Mr. Hirst tells us that the manufacture of dynamos and incandescent lamps was a flourishing industry in England, while that branch of technics was on the Continent still considered only suitable for laboratory research. Now, who is right—Mr. Hirst, or Mr. Raworth and Mr. Martin Smith, an eminent banker of London who was chairman of the company that returned its capital, and whose remarks I have read to you. Were we doing a flourishing business in dynamo manufacture in 1883, or is it not a fact that the demand for such material did not exist in any quantity, and that the demand did not exist for the reason that our otner methods of providing ourselves with light had so far developed as to make the removal of vested interests a somewhat difficult matter? Reference has been made to the fact also that our people went on to the Continent to install the light there, and that reason is also given in the statement of Mr. Martin Smith that the price of coal on the Continent permitted the use of the light and made it pay, while here it did not. Is it just for that reason that it must be assumed that Free Trade killed this industry? Now I leave the electrical industry for a moment and come to that question of general engineering to which Mr. Hirst devoted some attention. He says we were always prominent in bridge building until 1880. Well, gentlemen, some few years ago there was a bridge—it was called the Atbara Bridge. We lost the order, and the pessimists have been standing on that bridge ever since. It must have been a good bridge to bear the weight. We are to understand that ever since that time we have not made a bridge, and we cannot make a bridge, and it is all because of Free Trade. I will tell you what an important United States journal says regarding that:—"English and German makers who took alarm when we captured the Atbara Bridge, now complacently remark our higher costs in iron and steel. We know from Mr. Schwab and the Government that our cost of making a ton of iron has risen between 18s. and 20s. since, and in the interval, say English experts, their price has averaged 15s. a ton under ours." That is one of the ruined industries of our country. Then, Sir, there was a gentleman who spoke for the contracting interests. He wished to pay more money for his material, and was proud to range himself on the platform with those who wanted to make everybody else pay more for their materials. He was concerned about the steel makers, and this is the opinion from the other side I get about the steel makers:—"The world's export trade in steel rails is over 10,000,000 tons a year, and England and Germany share equally 80 per cent. of this. In the depression from the autumn of 1907 to the spring of 1909, our rail mills were half closed, but were not able to take any of the export trade away from the English mills." There are further points regarding that which I have, but I won't trouble to read them now, but they do state: "The foreigners say they do not fear our dumping now; they instead, and even the Chinese, are doing the dumping on our Pacific coast, where freight from Chicago or Pittsburg about negatives tariff protection." I come now to the point in Mr. Hirst's speech where he says, "I only wish to confine myself to the one argument, that under Tariff Reform or Protection we shall be able to produce in very much larger quantities, and by doing so, we shall be able to produce much more cheaply." He goes on to say, "Why can a manufacturer in a Protected country produce in larger quantities? Well, it stands to reason that a manufacturer who has a market of 60 millions of inhabitants secured to him—who has the advantage of preferential treaties with other countries, and who whenever he chooses, uses for any surplus the markets of the Free Trade country, I say such a manufacturer must have a bigger market, a secured market and a continuous market, invaluable points for producing cheaper than a manufacturer of a Free Trade country." Now if it stands to reason; if it be a fact, were it not better to put up the shutters and retire into the back parlour and take in one another's washing, because it is a fact which we must not overlook that our population will not enable us to compete on such terms. We have 40,000,000 of population and America has double that, and how can we ever expect, therefore, to manufacture as cheaply as America, if Mr. Hirst is correct? The simple fact is that it does not stand to any such reason. If it did stand to reason, why does America have any imports at all? We export our wool to the States. Their steel mills are idle. Why do they, in fact, if there was anything in Mr. Hirst's arguments, allow anything to come in at all? They imported in 1907 £288,000,000, of which £133,000,000 were manufactures. Then Germany—but I won't go into the figures there. I must rather concentrate my remarks, but I will try and keep to the main points as well as I can. Now, with regard to cheapness of production, Mr. Hirst remarks on the importance of cheapness, and Mr. Byng realises it, and they emphasised as the prime factor the quantity that could be produced, but they did not tell us a word about the cost of food which the labourer eats; not a word about the cost of clothes which the labourer wears; not a word about the cost of any of the amenities which go to make life bearable. These are the essential and invariable elements. The only idea they tried to bring home was the cost of production in the variable point of machinery. What is machinery compared to humanity? The individual must eat, he must be clothed, and there is the material—an important point to be considered. The quantity that you produce, and the cost at which you can produce, is a variable one. What is the result? You can unquestionably in a Free Trade country—I say unquestionably, but I should rather say, in my judgment, you can start the production of manufacture in quantities at a time in a Free Trade country when it would not pay you to do it in a Protectionist country. He tells you also of the importance of your market to the foreigners, and of how they can prepare their output so as to take advantage of your market—he tells you the value that it is to them to be able to so prepare. What do you suppose, gentlemen, is the value in the aggregate of your market for electrical materials to the manufacturers of possible competing countries? I have made a rough estimate—it can be nothing but a rough estimate—but I am prepared to say that it must be somewhere between 1 and 2 per cent. I should like to know how many English manufacturers can

arrange and estimate their production within 1 or 2 per cent.? The steel manufacturers of America have never reached 75 per cent. of their capacity of production—but, gentlemen, you must not assume that because I am dealing with matters in the aggregate that there is not great importance in Mr. Hirst's argument. The question of the manufacture in quantity is a most important one—it goes to the root of the whole question, and that is why I am a Free Trader. The cost of manufacture in quantities involves the expenditure of capital, which must be dependent upon the quantity required. If your consumption is small compared with the cost of installing the machinery and the plant, then it is infinitely preferable to the individual and to the nation that that purchase should be made from a factory where you get the benefit of that improvement and the lower price, than that you should give an extravagant figure, which would mean that something which is worth 1s. costs you 20s., if not more. Mr. Hirst tells you that when all this is done, when you get your 10 per cent. on lamps, nobody will be 1d. the worse. I venture to say that nobody will be 1d. the better. It is impossible that you can get protection for the lamps without the man who supplies the material and without the labour that goes into it getting a similar degree of protection. Therefore what you get with the one hand you will lose with the other, and the whole set of restrictions that come into the State will be a loss to the State. You can juggle with money, you can juggle with figures, but you will never get over this fact, that under Protection you are working through resistances. These Tariff Reform League gentlemen tell you that they can compensate for that by a scientific tariff. Do not believe them. America has tried it; Germany has tried it, and they have both egregiously failed, with the result that we have industries to-day which cannot possibly be maintained under that ideal of Tariff Reform which Mr. Hirst mentions. [The Chairman here intimated that the speaker's time had expired.] Just one minute—I want to give you an illustration—only one. I have been served with Dundee marmalade in a Niagara Falls hotel. I have noticed the prolific advertisements of Sunlight Zeep on the tramcars of the Netherlands; Huntley & Palmer have made the name of the little town of Reading known throughout the world. These things do not interest you—it is not your business—it is somebody else's business. I wonder whether it would not pay you to take a little interest in the subject before Dundee throws out of use some of its generator sets; before your orders cease to come from Reading and before Port Sunlight relapses again into green fields? Your interests are their interests; your home market depends upon the maintenance of these trades, and a thousand other smaller and larger trades which keep the country going. Take a little interest in the business that lies outside you, and don't keep the electrical penny so close to the eye as to prevent your seeing the sovereign in the distance.

Mr. Hirst: Before I reply to Mr. Kingsbury I would like to render a word of thanks to those gentlemen who have contributed to this interesting debate. I am particularly grateful to Mr. Garcke for the very able and concise manner in which he put such an excellent case for this side of the room. I am also grateful to Mr. Anderson, and I endorse every word he has said—even his remarks about Mr. Kingsbury's paper. As regards Mr. Oppenheimer, I will refer only to one point, because he touches a large issue. He said that in 1868 the Germans broke down the Customs duties between the various States, and that that was the beginning of their prosperity. That is all we ask. We want to break down the Customs duties between our various States which go to make up this great Empire and have one Customs wall round the whole, and our prosperity will start from that point. I would like to add one other especial point to this. When this Zollverein was formed, it was formed between the various German States. At the beginning, Bavaria, in particular, was inimical to the Union; it was inimical by reasons of traditional history and religion, and by its ties with the House of Austria, but within four years or less of the establishment of the German Zollverein Bavaria saw its interests with the rest of Germany, and drifted away from Austria, to which it had been linked for five or six centuries. That has been the effect of the Zollverein in the internal history of Germany. I am sorry that my friend Mr. Hammond has gone. He always adds to the enjoyment of a meeting, and I would have liked to have answered him satisfactorily. If he was a manufacturer once it was 30 years ago, when, according to my mind, all went well. If he says all these bills of exchange are wandering round like he illustrated, they can only wander round for a certain amount, so far as the exporter's balance is available, and for the difference he has not given any explanation. He said we bought £240,000,000 of corn, but did we buy it as cheaply as we used to? If we had still two millions of agricultural labourers and produced only £50,000,000 or £100,000,000 of food we should get the rest cheaper. We should not be paying what the foreigner asks of us, because we could make our own terms. While we produce in considerable quantities we can make terms. As regards Mr. Bond, he asks the very pertinent question as to what would happen to the various trades under Protection—the members of the building trades, the schoolmasters, and especially the girls. To refer to Germany, the moment Germany went ahead by its prosperity in industries there was a rush for industrial employment so that other trades and professions got scarce, and it became necessary for the State, for municipalities, and for all other trades to raise the rate of pay. At three distinct periods—I could refer if I were pressed for it to the actual dates when the measures went through Parliament—the standard of officials—military, civil and municipal—was raised on account of the attraction of the best brains to industrial pursuits, and that same thing will happen here if industry is more prosperous. I must necessarily be brief, although I must say that I have given Mr. Kingsbury an advantage. I have given him facts and clear statements, and I am willing to defend them, but not if he chooses to single out one sentence without giving the rest of the particular paragraph. But I am willing to defend every word I have said. I am afraid he put me at a disadvantage in his paper a fortnight ago; he did not state anything definitely. It was the greatest difficulty for me to know what peg to hang my coat on, and were it not for this evening's discussion, I would be almost at a loss to see how I could effectively reply. But what he has said this evening I will answer. He started by asking why I referred to cotton. I introduced cotton simply because I have said this whole question is at present influenced by that great industry, and others as well as they have the right to be heard and the country listens; I say let us in our industry do likewise, and, incidentally, I gave an argument of my own, and that was why I introduced cotton. Then Mr. Kingsbury surprised me by asking why I drew the balance-sheet in 1880. Surely Mr. Kingsbury would know, and I mentioned it in my paper, that it was only about the year 1880, after the Congress in Berlin, that Bismarck first started to introduce the tariff in Germany; it was first started about 1878 or 1879, but it was not effective immediately—it took a few years to show the results, and so I took 1880 as a round figure as the starting point, and as I stated, then we were at the height of our glory. As regards steam, there was nothing particular about 1846. I thought I made it clear that what I meant to convey was that about that time—in 1830, 1840, 1850 and 1860—the uses of steam were becoming greater and greater as a help in manufacture, and therefore it tallied with the early days of the Free Trade period, and as we were still the principal manufacturers, the principal suppliers of the world's markets for manufactured goods, naturally we reaped the greatest benefit of that help. Mr. Kingsbury speaks of the cost of production, and he again asks why do we not think of people's food and people's clothes and the rest of it. I maintain, and to be short, I put it very tersely, that if we had to pay our workpeople 33⅓ per cent. more than what we do now, it would amply pay them and leave them a margin for dearer food and dearer clothing should that be necessary, and yet we could produce cheaper by the larger quantities, exactly as other countries have been able to produce cheaper by the larger quantities. I am now, of course, rushing through my reply, and I cannot touch upon every point, but I should like you to give me just five, certainly not more than ten, minutes, because I want to answer Mr. Kingsbury by going down into details on the one electrical industry of which he knows more than I happen to know of spades—the industry which he selected as an illustration—I refer to the telephone industry, and I will quote one sentence. He said, "Protected States are behind in the display of enterprise originating in other States." I admit I was not quite sure that the telephone came entirely from America. I should have thought this country had something to do with its development, but I will take Mr. Kingsbury at his word. Why is it that the telephone industry prospered more in Sweden and Germany, which are Protected countries, than in this country, if, as he alleges, they are slower and have less opportunities to take advantage of a new industry originating in a Protected State? There were in the early days a number of telephone factories here connected with the equipment of exchanges, but they all one after another shu down; but in other countries they went ahead. He said "the value of the article should be the paramount consideration." Well, now that the telephone industry has ceased to exist in this country, are telephones cheaper here than in Germany, or Sweden, or the States? According to my experience I think they are not. "To start a factory for the purpose of a school," Mr. Kingsbury says, "is an expensive form of education." I do not know a different way of educating—I do not speak of the individual, but I speak of the nation. It is only through the workshop and repair shops that you can watch the commercial success or failure of a contract; it is only by conference between the engineer and the designer and the commercial man who watches so closely the success or failure of the enterprise, that you can constantly make economies in manufacture; you can constantly press for new ideas, and it is thus that inventions, as I put it in my paper, are the outcome of evolution. Surely Mr. Kingsbury does not mean to suggest that some scientist teaching at a university or at a technical college can do this sort of thing—it can only be done by practical experience, it can only be done in factories, and I do not consider it an expensive education, because whatever the costs it is cheaper for the nation. It is the only possible kind of education. Mr. Kingsbury might answer that we have got some factories existing; I admit they have been started in recent years—two, three or four. But they are not the outcome of Mr. Kingsbury's statement that "the industry, the trade or the market must first be established in a country before a factory is started." That market existed for many years, and I will tell him what started these factories. These factories were started for no other reason than that Tariff Reform or Protection has been in the atmosphere for these last six or seven years. In England we manufacturers know it has got to come, and it must come. The discussion of the subject of Tariff Reform has set everybody thinking. Many people in private life, in Municipal and Government services, have come to the conclusion that it will be necessary to rely upon ourselves, and they are bold enough to-day to ask for British products whereas they would not have dared to do so 15 years ago. They wish to be equal. They do not wish to be dependent on the foreigner, and it is on the strength of that that these factories, and factories in other industries, have been started, and what has been the result? I do not think the products of these factories have been dearer to the buyers, and they have given employment already to some thousands of people; they have made skilled workmen of what might otherwise have been porters and carriers at the docks, and on the landing stage. What effect that has on our social life if we train our workpeople to make them earn 40s.,

60s. or 60s. a week? Look what that means in the greater care they take of themselves and their families, and the affairs of their city or the town! That is a prize worth securing, but such a policy never enters Mr. Kingsbury's head, so long as he can buy 5 per cent. cheaper. I would like to say a word about the statement that "new industries might arise out of the ashes of the old ones." It has been dealt with this evening, and I therefore dismiss it quickly. But what does it mean when you speak so light-heartedly of it? You say it does not matter if industries should be ruined; that the skilled workman in a particular trade should be thrown out, either to emigrate, or to earn a low wage until he has learned another trade. I could go on much longer. I made a note about "dumping." Mr. Kingsbury absolutely surprised me by comparing dumping with underselling by the home producer. If there is underselling, or selling below cost going on between competitors in the home market, that must have an end, because the manufacturers manufacture under the same conditions, and if one sells at a loss long enough it is bound to ruin him. But if the foreign importer undersells, it is different. I could give a striking instance of an experience with a matter with which I am connected, but for reasons which are evident, I do not want to go into details. But I may say that if the foreign importer sells below our cost of production it does not mean that he makes a loss. He either gets his reward by cheaper production in making a larger quantity, or perhaps, for a time, by a higher price in his own market. He will ruin the industry in this country, and then the price will go back not only to the ordinary price, but probably higher; and I could mention instances in connection with industries where foreign competitors absolutely agreed to fix prices which we helpless people in this country have to pay, because we do not produce these articles. Is that Free Trade? I will now conclude, but I am sorry I cannot go further; I did not expect that Mr. Kingsbury could convince me to go to his side, but I am certain this debate may have convinced some of the waverers in the audience, or those who will read the instructive speeches. I for my part stand as firm as ever on the platform of Protection, because it will give us an advantage over our rivals in our home markets. This will enable us to produce cheaper, and we can attack foreign markets with greater success. It will enable us to make better reciprocal arrangements with other States. It will give us bargaining power with foreign countries and open up the markets of our Colonies and bring us in closer touch with them. It would give increased employment and raise the intellectual standard of our workpeople, and it would encourage production at home and make us more self-supporting and self-dependent, which is a national asset of the highest value. It would give encouragement to the employment of capital, which is the life blood of industry. Surely, under these conditions, we have the right to ask our Government to at least consider our position as well as other Governments have considered the position of our competitors, and it is not unreasonable to expect that the Government should take this active interest, because production and manufacture in the markets of the world has been the foundation of the greatness of Great Britain and of its world power.

Mr. Garcke: I beg to move a vote of thanks to the chairman for presiding.

The motion having been assented to, the Chairman said: I would like to remind you that this meeting was organised by the National Electrical Manufacturers' Association. That Association, while it cannot promise Protection, nor can it promise Free Trade, or a continuance of Free Trade, yet can provide you with a protection which both the Free Trader and Protectionist will welcome with open arms. It will help you to ameliorate and to overcome many of the difficulties which are at present besetting the manufacturers' path.

The meeting then terminated.

Electricity in Mines.—The Nottingham correspondent of the *Manchester Daily Guardian* (June 3rd) writes:—"There is much unrest in the Notts. coalfield, and the present outlook is causing great anxiety. It is nine months since the men employed at the Clifton Colliery came out on strike for better rates in connection with the coal-cutting machines, and the cost of the strike to the Notts. Miners' Association now reaches £15,000. The situation has been aggravated by the threatened lockout at Eastwood. Owing to the differences in thickness of seams in many Notts. collieries and the consequent severity of competition, the Midland Counties Coalowners' Association state that the introduction of machines and lower tonnage rates are necessary. Messrs. Baber, Walker & Co., since the strike at their five Eastwood pits three years ago, have embarked upon a £100,000 scheme to introduce electrical coal-cutting machines, and upon getting them into operation at three pits they offered revised rates which the men refused. Accordingly 1,500 men have received notices, and in all probability 1,500 men at the other two pits will strike in sympathy with their comrades. Yesterday morning the boys at the Radford Colliery refused to work, and the pit, employing 500 men, has been thrown idle."

Gas Poisoning.—A mysterious occurrence took place on Friday last in Neal Street, London, when eight persons, living in three houses, were poisoned by an unknown gas in the small hours of the morning. The gas company could find no escape, and it is stated that the gas was not coal gas. A breakdown in the electric mains took place in front of one of the houses, owing to the breaking of a water pipe, but there is no evidence that this was the source of the gas. No lives were lost.

THE EFFECTS OF FREE TRADE OR PROTECTION.

[COMMUNICATED.]

That great interest was manifested in the two evenings' debate at Caxton Hall on the above subject was evident from the attendances on each evening. As regards the speeches of Mr. Kingsbury and Mr. Hirst, with which the proceedings were opened for Free Trade and Protection respectively, it struck me that while Mr. Kingsbury presented his case in a manner more academical than forcible, the speech of Mr. Hirst was far from convincing The onus of proof lies, of course, with the Protectionist. He has got to show, and show conclusively, that the state of things under which—I do not say because of which, but under which—the commerce and trade of the British Empire have been developed to their greatest extent, is fundamentally wrong, and that it is necessary for it to be altered if we are to maintain our position as a great commercial nation and escape financial perdition. Well, to my mind, such proof has not been forthcoming. There have been many statements, plenty of assumptions, no end of declamation, but of proof not a shred and of real argument but an infinitesimal quantity.

On the first evening a gentleman read certain extracts from, I think he said, a German Encyclopædia published 60 years ago. In those days, it said, Great Britain had command of every market on the globe, with no competition in her manufactures. She was mistress of the mechanical arts and engineering sciences, and, as a consequence, was the workshop of the world. Though from a foreign source, that was a clear statement of facts, and there is no doubt about the truth of it; while by the repeal of the Corn Laws a plentiful supply of food was always obtainable from other countries, which was paid for by goods produced in British factories. Our trade flourished and our population grew. We bought our raw materials duty free, and having converted them into manufactured goods, dispatched them to every part of the world. But we did not stop at sending manufactured goods, for in due time we supplied machinery to customers abroad for the very purpose of enabling them to manufacture the raw material themselves. It followed as a perfectly natural step in the evolutionary process that, as the foreigners gained mechanical knowledge, they made themselves, from the English models, the further machinery they required. If the machines were used in the manufacture of some product which Britain had to import, what more likely than that they should be better perfected in the country to which the product was natural, and that in course of time such machines should find their way back to Great Britain to operate the raw material she continued to import? All this was perfectly natural, and, fostered by ourselves, it represented the growth and development of international industry.

Now I have never heard it denied that, in the early days referred to, the free importation of food was beneficial to the industrial development of this country, nor have I heard it stated that the exportation of machinery was an economic crime. But, we are told, "nowadays times have changed. It was all very well when we only got food and raw materials from other countries, but when they are sending us manufactured articles to compete with our manufactures, it is high time we should do our best to keep these articles out." Putting on such a duty as will stop these imports is called Tariff Reform, and we are told that its adoption will be beneficial to industry generally. There is not the least likelihood that any Government would, in a new tariff scheme, give preferential treatment to the electrical industry, and what we have to consider is the effect of tariffs on industry generally. With preferential treatment, the electrical industry might live very happily at the expense of other industries, but when considered as a general proposition, the Protectionist doctrine inevitably breaks down.

Mr. Hirst, in his opening speech, observed that we were at the zenith of our industrial power in the early eighties.

Whether that was so or not really does not matter, but anyone who considers the condition of Europe in the early seventies after the Franco-Prussian war, will realise that great industrial changes were then imminent. Here were a number of States welded by a successful campaign into a solid and most formidable Empire. They were in a position to enjoy the years of peace which would follow their success in war, and they had, moreover, at their disposal the huge indemnity which was to be paid to them by France. Was it likely that this Empire would fail to develop its commerce and industry with all the energy which its immense resources called for? Such an opportunity was never presented to a nation before! Throughout history the arts of peace have ever been evolved from the arts of war; the German States were highly skilled in the arts of war, and can we wonder then at the industrial progress of Germany? Can we marvel at the circumstance that it was the newest, most scientific and attractive industries that she gave her special attention to? We cannot expect other countries to remain stagnant. We in this island have had a long spell of peace in which to develop our industries, and now it is the turn of other peoples. In the history of every civilised nation there comes a time when she "beats her swords into plough-shares, and her spears into pruning hooks," and it is then that she takes her place in the industrial warfare, a warfare which though fought in workshops and counting houses, with brain and money, is not less incessant or less fierce than that which she had erstwhile fought on battlefields with blood and iron.

There is one circumstance the significance of which has been ignored by Mr. Hirst and his backers, and that is, that we pay for our imports by exports. From this conclusion there is no possible escape. When goods are sent into this country we pay for them by sending goods out, and the goods sent out balance those sent in, save as regards the imports which come to us in discharge of interest on capital. The ebb and flow of bullion is on a scale too minute to do much towards the settlement of international accounts. A country rarely possesses more or less specie than is required for the purposes of currency, and we know that whenever the distribution of gold tends to become abnormal, forces are at once established which restore the balance. Now, this fact that imports are paid for by exports is the crux of the whole matter. It must never be lost sight of for a single instant, and it must be pressed upon every so-called Tariff Reformer until he realises that, by the inexorable law of logical sequence, he cannot have exports without having imports, and in so far as imports are restricted will exports be also restricted. One cannot be curtailed without the other. For every £100 worth of foreign articles, which, by prohibitive duties, we prevent from coming into our country, we prevent £100 worth of our own articles of production from going abroad. To have exports without corresponding imports is an absolute impossibility. One might as well try to think of a mountain without a valley, a shadow without a light or a square without corners. The inevitable result which Tariff Reform must bring about is a shrinkage of our foreign trade. Is that what Mr. Hirst wants? The doctrine that foreign trade is an evil is, though questionable, at all events intelligible; but to maintain that foreign trade is a good while the influx of foreign commodities is an evil, is a palpable contradiction.

It has been the fashion for some Free Traders to credit all our success in trade and commerce to the influence of Free Trade, while Tariff Reformers have not been a whit behindhand in putting down success in trade and commerce abroad to the credit of high tariffs. Both are wrong. Given a virile, energetic nation, with natural resources and high intelligence, it is bound to develop under any fiscal system. Britain, America and Germany are the three nations in the front rank of industry, and all are prosperous and progressive. Britain has Free Trade, America has high Protection, while Germany has a tariff which, as compared with ours, is protective, but which, as compared with America's, may be termed Free Trade. America is great because she has the greatest natural resources. She has most coal, iron, copper, lead and oil. She is the richest country in the world, and no fiscal system could alter this, whether it let every commodity in free or blocked up her seaports and closed her harbours. As compared with America, Britain and Germany are poor in natural resources, but each is rich in these as compared with any fourth nation. Both are great coal countries, and where the coal is there will the industries be found. These reflections show that America and Germany are not great because of Protection, while it may also be shown that the one Free Trade country—Britain—has still the most magnificent commerce in the world, exporting as much as America and Germany put together, owning half the world's ships, and holding a large part of the world in pawn.

I generally sympathise with the Protectionist, because, as a rule, due to some circumstance or other connected with his business, he is a man who has been hard hit. But while Protection may appeal strongly to those who *feel*, I am convinced that only Free Trade can appeal to those who *think*. Consider how the Protectionist proposes to improve things. Says he to a foreign country:—"If you do not reduce your tariff, and as a consequence take more of our goods, we will put up a tariff against you and take less of yours." If the foreigner agrees to reduce his tariff, well and good, our exports and our imports both increase. If he does not, and we carry out our threat, we diminish our imports and consequently our exports too. The real truth is that the Tariff Reformer proposes to do his country a serious injury, unless other people agree to alter their fiscal policy. Suppose that other countries refuse our offer and that a duty is clapped on, such as will reduce our importation by £10,000,000 a year. The foreigner certainly will not like it, but how shall we get on ourselves with £20,000,000 less foreign trade, with the price of the articles we were accustomed to purchase from abroad raised, and with the manufacturers who used to export goods in exchange for them partially ruined? It has been usual to call this reciprocity, but I call it "cutting off one's nose to spite one's face." Mr. Hirst proclaims himself a Free Trader by conviction, but he has no objection to the sacrifice of his principles. "I am at heart a believer in Free Trade," he says, but to the foreigner he continues in effect, "if you do not also become a Free Trader I shall become a Tariff Reformer." That position is almost too absurd for criticism! I can understand one saying if you hurt me I shall do my best to hurt *you*, but I cannot understand one saying, if you hurt me I shall do my best to hurt *myself*. That is, however, what Hirst, Garcke, Bruce Anderson *et hoc genus omne* are continually saying and repeating.

What possible good would be done to anybody by keeping £10,000,000 of imports out of the country? There is an idea in the minds of Protectionists that if we keep out goods from abroad it is for the good of the community, since they must then be made at home, but what would really happen is that we would, under Protection, manufacture what we used to import, and cease to manufacture what we used to export in exchange. There is no advantage in that, but a positive disadvantage, because we would then make something which we were less fitted to make, and cease to make what we were eminently adapted for producing. We would have expended less time, money and brains in getting the commodities in the old and indirect way, that is, by buying them from abroad, and sending abroad goods to pay for them. When sounded to its depths Protection is not as good business as changing a sixpence for two threepenny bits!

In short, the Protection idea is based on a gigantic fallacy. It looks pretty and alluring at times, but facts are against it, and other means of developing our commerce must accordingly be thought of. The fallacy is made conspicuous by the circumstance that Mr. Hirst can imagine our ceasing to manufacture—that is, our having imports without exports. In illustration of his views, he instances the case of 10 million imported incandescent lamps, which he would like to keep out of Britain. Well, someone manufactures goods which are exported to represent the value of these lamps, and I would like to ask Mr. Hirst what works are to be reduced to short time running in order that his lamp factories might run full time? In other words, what industry is to be wholly or partially ruined in order that the lamp industry may succeed?

Though the science of Economics is complex, and presents an infinite amount of detail to study, there are certain broad principles regarding which there should be no differ-

ence of opinion. One I have mentioned, and that is the relation of imports to exports. Perhaps this matter can be more readily grasped if, in imagination, we divide the kingdom into two sections—first, a section for which the food raised in the country is just sufficient, and secondly, a section which depends for its sustenance on foreign countries. The first is, we may say, self-supporting, and its agriculture, fruit culture, fisheries, manufactures and industries are all interdependent, while it gives nothing to, and receives nothing from, outside. This may very well have represented the condition of the community in early times, and it presents no exciting problems for us. Now take the other section. This depends for sustenance solely on the foreigner, because all the food raised in the country is by assumption used up to feed the self-supporting section. But the section which depends for its food upon outside sources has the ability to make commodities, and it exercises its manufacturing capacity to such purpose that in exchange for its manufactures it gets all the food and luxuries it wants, with a goodly number of articles manufactured by other countries thrown in. Now, here we have the position in a nutshell. Diminish the manufactured articles entering, and the people begin to make them themselves, but cease to make the things they exchanged for them. Diminish the food supply, and the people cease to manufacture the things exchanged for food, cultivate more land, and become agriculturists, &c. The combination of these two imaginary sections, one self-fed and the other fed from outside, may be taken to roughly represent Great Britain, but the fact that the imposition of a tariff will not alter the aggregate of employment, but only its nature, the Protectionist cannot, or will not, see.

"Your talk of exports balancing imports is all nonsense," says Mr. Garcke, "because we export coal and other commodities on which very little skilled labour is expended, and our imports consist of manufactured articles, the production of which provides a means of subsistence for a large number of people." I wonder if Protectionists ever consider how the prices of different commodities are arrived at; the prices of things as far apart, for example, as a ton of coal and a diamond ring. Before coal can be got to the surface, shafts have to be sunk, winding, hauling and pumping gear erected, and a great deal of capital spent in other ways. Before gold or diamonds can be obtained large capital expenditure is also necessary. A colliery proprietor will say that the price of a ton of coal includes interest on capital (*i.e.*, profit), salaries, wages, repairs and maintenance of machinery, sundry materials and stores, and royalty (*i.e.*, rent). But there is no item "coal," for the simple reason that coal, *per se*, has no value whatever; it is the capital involved, and the expense of winning it, that alone confer on it a value. To the diamond ring the same argument applies. There are included in the price interest on capital, salaries, wages, &c., but no item "gold" or "diamonds," because the raw materials have no value in themselves, and on the finished jewel a value is only conferred in respect of the capital expended to get the metal and the stone in respect of the labour at the mines and wages paid for cutting and polishing the diamond in Amsterdam and setting it in Paris. The fact is that when £1,000 worth of coal is exchanged for a diamond tiara or a tray of gold watches costing the same sum, there are really exchanged—subject to correction for interest on capital—equivalent amounts of labour. The circumstance that for the same labour value there goes a greater weight of raw material in one case than in the other is of no consequence, for the raw material is in any case thrown in. It is merely a vehicle for the exchange of labour, and is given away, a fact which appears to me to give away Mr. Garcke's case.—W. B. E.

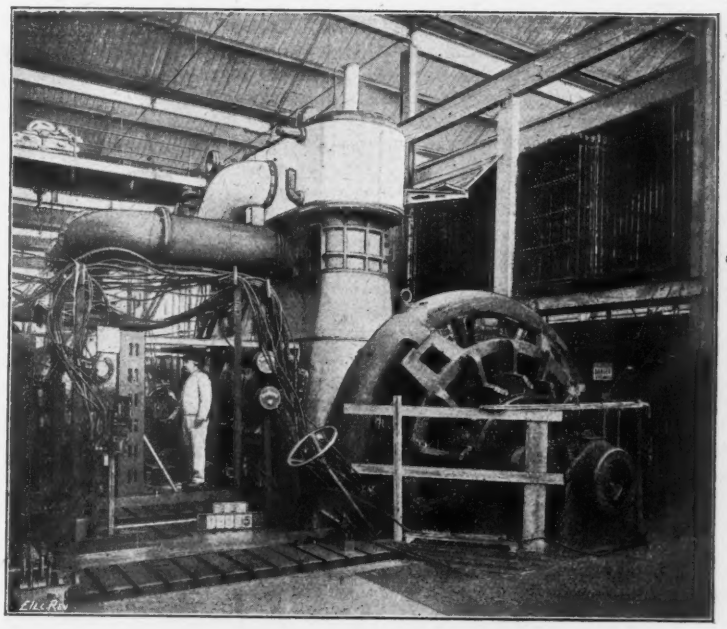
A LARGE ALLEN ENGINE FOR MELBOURNE.

On Friday last, through the kindness of Messrs. W. H. Allen, Son & Co., we were enabled to inspect the largest engine which has so far been built at Queen's Engineering Works, Bedford—in fact, it is one of the largest high-speed engines which has ever been built in this country.

The engine, which develops 2,160 H.P. on the brake and is coupled direct to a 1,500-KW. interpole generator by the General Electric Co., Ltd., has been built to the specification of Mr. Harper, the city electrical engineer to the Melbourne Corporation, which, it may be added, has already three 1,000-KW. Allen engines in service.

The engine follows Messrs. Allen's standard construction, being of the triple-expansion enclosed forced lubrication type, with piston valves, designed to develop full power at 225 R.P.M. with 160 lb. steam pressure, superheated 150° F., and exhausting into a 26-in. vacuum. The engine is, however, specified to carry an overload of 20 per cent. for three hours, giving 2,600 B.H.P.

The cylinder dimensions are 22, 34 and 55 in. diameter, with a 26-in. stroke; the intermediate and low-pressure



Large High-Speed Steam-Dynamo for Melbourne.

piston rods are carried through the top covers, and metallic packing is used in all glands. The steam supply is controlled by a geared centrifugal governor acting directly on a throttle valve, and arranged for a 3 per cent. speed variation, full load to no load; a live steam by-pass is provided to the intermediate cylinder for emergency use during overloads or when running non-condensing.

The weight of the reciprocating parts is carried by steam balance pistons, and the oil circulation to all the moving parts is secured by means of a couple of valveless pumps driven from one of the large eccentric straps, and giving a pressure of 15 to 25 lb. per square inch; an oil strainer is provided.

The engine exhausts directly into one of Messrs. Allen's well-known Conqueror surface condensers, having 2,240 sq. ft. of cooling surface.

The condenser is of the counter-current type, and the maximum cooling effect on the steam is secured by means of suitable baffles between the nests of tubes. It will give the specified vacuum of 26 in. when dealing with 28,000 lb. of steam per hour, and 25-in. vacuum at 20 per cent. overload, with 1,400 gallons per min. of circulating water at 65° F.

A three-throw 12 in. × 10 in. Allen air pump with hot-well pump attached is provided, which is direct driven by an 11½-B.H.P. Allen motor running at 145 R.P.M., and capable

of a speed variation of 15 per cent. above and below normal. The condensing plant will work in connection with circulating plant already existing in the Melbourne works.

The generator, we may add, is of the interpole type with 14 main poles, and is designed for use on the lighting and power load. It is capable of giving 20 per cent. overload for 2 hours. The plant, as a whole, is an excellent example of British workmanship, and reflects great credit on the builders.

THE TRAMWAY CONGRESS.

LIKE so many other social and serious events the Congress, which was to have been held in Dublin in May, had to be postponed for a time. Upon the 9th and 10th of this month the Congress met, and it seemed to us who were lucky enough to be of the party that the interval had served to increase, if that were possible, the warmth of our welcome, as certainly it had tempered the chills of Whitsuntide.

Not in many years will the British members forget the hospitality with which their Irish hosts received and cherished them. The kindliness of the Irish Channel, and the comfort of the steamers, prepared them fitly for the luxurious smoothness of their progress through the land of the Dublin United Tramways Co., at the invitation of the directors and their genial secretary, and under their personal guidance.

Thursday was devoted to business, and, owing to the common-sense arrangement of taking all the papers as read, it was possible between 10 a.m. and 3 p.m. to dispose of five papers without using the guillotine, or restricting discussion in any way.

Mr. Tresilian's most interesting story of the birth and brilliant life of the Dublin United Tramways, up to the present day, naturally was not subjected to criticism; nor do we think that members could have given aught but praise if it had been an open paper read after an inspection of the undertaking.

Mr. Panton's dissertation upon a universal brake-shoe produced a discussion, reflecting in but a feeble manner the sympathy with the author's ideas which we are sure any thoughtful man must feel.

Is it not palpably evident to everyone who makes a study of the scrap heap an occasional duty, that an enormous wastage of material arises from the difficulty or the impossibility of pulverising more than some 40 per cent. to 60 per cent. of a brake-block in the useful dissipation of energy? Even more unfortunate is the diversity in type and design of shoe and head. Matters have improved, perhaps, since the day when it was necessary to stock right and left-hand patterns and castings, so that a four-wheeled truck of any kind required two styles of brake shoe, and a "maximum-traction" truck required four patterns, but we are still very far from the ideal state which Mr. Panton set before us.

We desire to associate ourselves once more with the principles which Mr. Panton has adopted.

Not only was Mr. Salter's paper upon "Tramway Economics" the weightiest of the five which are printed in the *Official Circular* for May, but Mr. Salter in sketching its contents before throwing it open to discussion, as well as in replying afterwards to his critics, displayed an amount of talent which must have been a source of envy to those of us who are not so notably endowed with the gifts of lucidity, ease, polish, urbanity and smartness. It was with additional regret, therefore, that the audience heard the contents of Mr. Mallins's written contribution to the discussion, as its tone contrasted harshly with what preceded it.

The paper excited a lively and generally intelligent criticism. Mr. Salter's chief aim is to kill the long-accepted figures of merit, which are represented by the relationship between working expenses and receipts, and by receipts per car-mile, and to substitute a rational touchstone, based upon the car-miles per mile of route per annum.

Incorporated with the paper for purposes of graphic illustration are some of the well-known curves for which the late Mr. Bellamy's annual reports were justly famous. We shall hear a great deal more of the principles enunciated in Mr. Salter's paper.

Mr. England was unable to attend the Congress, so that there was no reply to the trenchant criticisms by Mr. Pott and others on his paper entitled "Railless Traction." The general feeling of the meeting seemed to be in opposition to the idea that railless traction has a prospect of success in anything but special and unusual circumstances; and it is possible that Alderman Ivey echoed the sentiments of the majority in declaring that those who wanted to play with 'buses should do it properly and straightway use a motor-'bus.

Mr. Coutts read a short paper giving reasons for a revision of the Act of 1870, but the subject had not enough of novelty to draw out a discussion.

In addition to the papers upon the Agenda, members were favoured with a short but most interesting note by Mr. Sheardown on the extraordinary failure of the "Heavenly Twins," as the two steel stacks at Ringsend are nicknamed locally, and on the ingenious manner in which the situation was faced and saved.

The presentation of this note was followed by an inspection of the Ringsend power station, which has not changed a great deal since it was described in the ELECTRICAL REVIEW; but it is always interesting as an example of design on American principles.

It is pleasant to note that the latest instalment of plant was made in England, and a number of members were astonished at the insignificant appearance of this 1,000-KW. steam turbine set in comparison with the cross-compound, low-speed, vertical engine sets, of half the output, which occupy an engine room of height suitable to their majestic proportions.

In the evening the members of Congress were entertained at dinner in princely fashion. The toasts usual upon such an occasion were received and honoured with generous enthusiasm, and the musical programme was appreciated in a very marked manner. In that, as in every other detail, the hosts gave their guests the best to be found in Dublin, and that is no mean thing.

Friday was devoted to an inspection of the whole of that magnificent stretch of tramway line under one control and ownership, which encompasses Dublin Bay from far Dalkey to distant Howth, only the drive round the bluff Hill of Howth (pronounce it softly, Sassenach!) being made on the electric cars of the Great Northern Railway of Ireland. Lunch was served at Kingston, and afternoon tea at Sutton.

To those who could distract their attention from the scenery to observe details and general features of construction and of traffic management, this long ride was brimful of educative opportunities.

It is not within our province to descant upon natural beauties, but we cannot refrain from saying here that in Killiney Bay, as seen from the heights of Sorrento or from Killiney Hill, the Irish possess one of the most beautiful and perfect pictures in the whole world.

Abstracts of, or remarks upon, the various papers will be given in a later issue, and we will bring these general remarks to a fitting close by expressing our most sincere thanks to the chairman, directors, secretary, engineers, and staff of the Dublin United Tramways for their memorable treatment of the members of the Congress.

(To be continued.)

Cable Works at Ipswich.—The Ipswich Dock Commission has declined to grant a site on the Nova Scotia Estate to the Standard Cable Manufacturing Co., Ltd., of London, for the erection of a proposed factory, it being considered inadvisable to part with the land.

Bonus to Coventry Employés.—As we stated a fortnight ago, the electricity department for the year shows a net surplus of over £10,000. One very praiseworthy way in which part of this balance is to be disposed of is the granting of a bonus equal to a fortnight's wages to the employés. A pamphlet relating to the Coventry undertaking and the extensions and additions of new machinery is published by Messrs. E. Bennis & Co., Ltd., of Little Hulton, who will forward a copy to any reader interested in fuel costs and boiler house economies.

STREET LIGHTING: ELECTRICITY v. GAS.

UNDER the above heading we referred last week to the visit of members of the Corporation of the City of London to Berlin to inspect the street lighting, and the statement in the quarterly issue of *Gas Progress* "that this deputation reported that the electric lamps were to be superseded by high-pressure gas lamps." We have now before us the report of another local authority on the same subject, which raises other interesting questions.

It seems that last autumn a deputation of the Gas Committee of the Corporation of Bradford visited Berlin, among other Continental cities, for the purpose of inspecting the vertical and other improved types of gas retorts in use there. They naturally compared gas with electric lighting, and being a Gas Committee, it is not surprising that they were readily impressed with the superiority of the high-pressure incandescent gas, and came away with the belief that "in four years there would be no electric public street lamps left in Berlin."

At the risk of disturbing the equanimity of these gentlemen, and to show that, perhaps, the "wish is father to the thought" in the sanguine views of these gas advocates in Berlin and Bradford, we publish the following letter of a leading authority, who writes from Berlin in reply to an inquiry as to the truth of the reports that street lighting was to be changed from electricity to gas. He says:—

"In reply to your inquiry, I beg to say that there is no question of *substituting* high-pressure gas for electric light in Berlin. On the contrary, a decided increase in lighting by flame-arc lamps may be expected. At the same time, high-pressure gas lighting is extensively used, and *is being adopted in the streets which have hitherto been lighted by gas.* The reason for the adoption of high-pressure gas lighting, instead of electric light, is chiefly to be found in the fact that *the gas works are under municipal control*, and the city of Berlin, therefore, takes an interest in their development; whilst electricity is supplied to the town through a private company, die Berliner Elektricitätswerke."

Thus, in Berlin, as everywhere else, the electric light goes on ahead, and well ahead, while the modern Mrs. Partingtons try to stem the advancing tide with their gaseous brooms.

Bradford was the first town in the country to start municipal electric lighting; but it had already municipalised the gas supply eighteen years before, and probably the reason for acting as it did was to protect the gas business from the competition of a private electricity supply company, so that the Corporation are really engaged in working rival systems, with all the disadvantages which must naturally follow.

If the Bradford public are to be fully informed about street lighting in Berlin, the Electricity Committee ought to visit that city and make a report as well as the Gas Committee, when the rival views would doubtless make interesting reading.

In connection with street lighting by municipalities, another interesting development recently arose at the Local Government Board inquiry at Grimsby into the question of a loan for lighting all the side streets by electricity. To carry out the scheme recommended by the Corporation, a sum of £2,000 was necessary, for which the sanction of the Board was required.

The inspector appointed was Mr. H. R. Hooper, who appeared in a not unfamiliar *rôle*, viz, that of advocate of leaving things as they are. He said:—"The gas lighting seems to be very fair in Grimsby. I have been through many streets at night. I don't know that one could say quite the same of some of the electric lights I saw last night. The arc lamps did not seem to be giving a very efficient light." The town clerk explained that the present arcs were being converted into flame arcs, but Mr. Hooper, posing as an illuminating engineer, objected to the system of flame arcs, and declared that they were liable to give a good light in one spot, but not to distribute the light well, and added:—"You intend to supersede the present system of street lighting; is the present light unsatisfactory?"

In vain the town clerk assured the inspector that there had been many complaints of the gas, and none of the lighting by incandescent electric lamps, some of which had been running for about three years, for he then demanded that the proposed change must be shown to cost no more, and that there was to be a profit.

Then the Inspector ventured upon a criticism of the metallic-filament lamps, suggesting that with 63 watts they would not last more than 200 or 300 hours, giving 50 C.P. The town clerk replied that his experience showed that they would burn for over 2,000 hours. "But then," said the Inspector, "You won't get 50 C.P."

All this was very entertaining, but it gives rise to some very important questions. What are the functions of an Inspector of the Local Government Board in relation to inquiries into loans for such a purpose? Surely the Electric Lighting Committee of a Corporation, advised by their engineering experts, and acting in the interest of the ratepayers, are not to be controlled in such a matter as the lighting of the public streets by a Government official, who may be as ignorant of the subject as Mr. Hooper appears to be.

The local Grimsby paper, writing in the interest of the gas company, considers that in the controversy "gas seems certainly to have scored"; and it instances the case of Piccadilly, where gas has ousted electricity, winding up with the usual assertion that "gas is not only much cheaper, but that it gives a much softer and better diffused light than electricity!"

The gas interests are fighting hard in their last ditch, and the instances we refer to in the present article show how necessary it is for all engaged in the electricity supply industry to adopt the most active publicity methods in order to counteract their wiles.

FOREIGN AND COLONIAL TARIFFS ON ELECTRICAL GOODS.

PARAGUAY.—It is imperative that the exact net and gross weight in kg. should be marked on each package and specified on invoices, bills of lading, &c. The net weight of each class of goods should be stated, and the country of origin given on all documents. Goods should be marked "In transit for Paraguay." Goods for Paraguay which are shipped *via* Monte Video or Buenos Ayres must comply with the Consular requirements of Uruguay or Argentine, as the case may be. Through bills of lading are issued, but transit entries must be passed at the port of transhipment before the goods can be forwarded to their destination. Merchants' invoices in triplicate in Spanish must be certified and signed by the merchant beneath the total, and must be presented with bills of lading. They must also be presented to the Consular offices in the country of origin for visa, for which the fees are as follows: invoices, 8s.; bills of lading, 4s. Duties are levied in percentages of values fixed by the Customs. The following duties are payable on electrical and similar goods:—

Peso = 4s.

	Percentage.	Valuation fixed. Pesos per kg.
Wire of copper, tinned	35 %	·45
Wire of iron or steel, galvanised:		
Up to No. 14	free	
From 15 to 20	35 %	·10
Over 20	35 %	·14
Wire of polished steel	35 %	·40
" iron or steel, bronzed or coppered	35 %	·08
Pumps, electrically-driven	35 %	·30
Bells, alarm for doors	35 %	·70
Wire of copper in general	35 %	·45
Copper wares, fine	35 %	·90
Sleepers and fish-plates; wheels; machinery in general not separately mentioned in the tariff; motors	free.	
Electrical accessories: Cut-outs, interruptors, keys, commutators of all kinds, switches, fuses, plugs, &c.:		
With base and cover of porcelain or wood	35 %	·55
With porcelain base and covers of metal, papier-mâché, or wood	35 %	·90
With base of slate or marble, with or without cover	35 %	1·20
Not put together, in detached parts of bronze or copper, without the corresponding base of porcelain, slate or marble	35 %	2·50

	Per-centage.	Valuation fixed. Pesos per kg.
Connections, &c., of brass	35 %	1·50
Insulators of glass	35 %	·06
Insulators of porcelain of more than 3 cm. dia. with or without hook	35 or 40 %	·12
Ditto up to 3 cm. dia.	35 or 40 %	·25
Wire or cables up to 5 cm. dia. bound with cotton, rubber or other materials, with the exception of those with covers of lead or silk and all kinds of flexible wire	35 %	·70
Ditto of more than 5 cm. dia.	35 %	·60
Ditto up to 5 cm. dia. encased in lead	35 %	·50
Ditto more than 5 cm. dia. encased in lead ...	35 %	·50
Ditto covered with silk, of all diams.	40 %	2·50
Of lead of whatever number	35 %	·15
Subterranean encased in lead and then in iron	35 %	·25
Of iron or steel covered with cotton, rubber or other materials	35 %	·30
Flexible cords of two or more conductors of whatever dia. except those covered with silk	35 %	1·50
Ditto covered with silk	40 %	2·50

(To be continued.)

NEW PATENTS APPLIED FOR, 1910.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by MESSRS. W. P. THOMPSON & Co., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

13,040. "Improvements in couplers for electrical switches." F. W. COTTON. May 30th.

13,052. "Improvements in apparatus or appliances for automatically lighting and extinguishing gas, electric and other lamps, and for analogous uses." C. EARLE. May 30th.

13,095. "Improvements in circuit arrangements for telephone exchanges with automatic calling devices." SIEMENS BROS. & Co., LTD. (Siemens and Halske Akt.-Ges., Germany.) May 30th. (Complete)

13,104. "Improved method of and apparatus for telegraphically transmitting and reproducing pictures and the like." L. TSCHORNER. (Date applied for under Sec. 91 of the Act, June 30th, 1909, being date of application in Austria.) May 30th. (Complete)

13,123. "Improvements relating to the control and protection of electric motors." BRITISH THOMSON-HOUSTON Co., LTD. (General Electric Co., United States.) May 30th.

13,124. "Improvements in systems of electrical distribution." BRITISH THOMSON-HOUSTON Co., LTD., and A. R. EVEREST. May 30th.

13,125. "Improvements in and relating to dynamo-electric machines." BRITISH THOMSON-HOUSTON Co., LTD., and H. WOOTTON. May 30th.

13,165. "Receptacle or socket for electric lamps." W. S. RYAN and L. HENGERER. May 31st. (Complete.)

13,176. "Improvements in coating electric cables." M. S. CONNER and PEEL-CONNER TELEPHONE WORKS, LTD. May 31st.

13,177. "Improved construction of telephone receivers." M. S. CONNER and PEEL-CONNER TELEPHONE WORKS, LTD. May 31st.

13,195. "Improvements in switches for use in the control of electric motors." ADAMS MANUFACTURING Co., LTD. (Cutler-Hammer Manufacturing Co., United States.) May 31st. (Complete.)

13,197. "Improvements in or relating to the adjustment of electric and other lamps or fittings." JESSON, BIRKETT & Co., LTD., and T. BIRKETT. May 31st.

13,224. "Improvements in or relating to starting devices for electric motors." ADAMS MANUFACTURING Co. (Cutler-Hammer Manufacturing Co., United States.) May 31st. (Complete.)

13,243. "Improvements in and in connection with insulators for telegraph, telephone and like wires." H. W. MOORES and A. MOORES. June 1st.

13,257. "Improved 'brush' or contact arrangement particularly suitable for dynamo-electric machines." N. PENSABENE. June 1st.

13,261. "Electrically-controlled device or arrangement of mechanism for automatically-locking the carriage doors of a railway train and simultaneously unlocking same as the train arrives in front of the station platform." W. F. NESBITT. June 1st.

13,278. "Improvements relating to magneto ignition for internal-combustion engines." J. BAKER. June 1st.

13,283. "Improvements in or connected with electric lamp and like bulbs." S. O. COWPER-COLES. June 1st.

13,292. "Means for and methods of limiting the current on a short-circuit." A. M. TAYLOR. June 1st.

13,293. "Improvements in and relating to apparatus for the production of electrical flashes more particularly suitable for use with advertising devices." H. V. GOOD. June 1st.

13,295. "Improvements in leading-in conductors for electric devices." BRITISH THOMSON-HOUSTON Co., LTD. (General Electric Co., United States.) June 1st.

13,299. "Improved means for effecting telephonic communication without connecting wires." E. G. MATTHEWS. June 1st.

13,305. "Improvements in or relating to electric arc lamps." H. J. J. JABURG. (Date applied for under Sec. 91 of the Act, June 2nd, 1909, being date of application in Germany.) June 1st. (Complete.)

13,311. "Improvements in and relating to electric fuses." V. G. MIDDLETON and C. J. BAKER. June 1st. (Complete.)

13,325. "Improvements in or relating to controllers for electric motors." ADAMS MANUFACTURING Co., LTD. (Cutler-Hammer Manufacturing Co., United States.) June 1st. (Complete.)

13,330. "Improvements relating to dynamo-electric machines." E. C. KETCHUM. June 1st. (Complete.)

13,335. "Improvements in or relating to starting devices for electric motors." ADAMS MANUFACTURING Co., LTD. (Cutler-Hammer Manufacturing Co., United States.) June 1st. (Complete.)

13,336. "Improvements in the art of synchronising alternating-current generators." H. W. LAKE. (Weston Electrical Instrument Co., United States.) June 1st. (Complete.)

13,355. "Improvements in and relating to the ignition apparatus of gas engines." C. S. SYDENHAM. June 2nd.

13,405. "Improvements in vapour electric lamps, such, for instance, as mercury-vapour lamps." J. H. VINCENT. June 2nd.

13,406. "Improvements in or relating to devices for controlling the speed of electric motors." ADAMS MANUFACTURING Co., LTD. (Cutler-Hammer Manufacturing Co., United States.) June 2nd. (Complete)

13,410. "Improvements in dynamo-electric machines." BRITISH THOMSON-HOUSTON Co., LTD. (General Electric Co., United States.) June 2nd.

13,476. "Improvements in or relating to electric switches." W. MCGEOCH and W. MCGEOCH & Co., LTD. June 3rd.

13,481. "Improved insulating device for electric lampholders." H. HIRST and H. J. COATES. (Application for Patent of Addition to No. 17,101/09.) June 3rd.

13,482. "Improvements in or relating to carbon-holders for electric arc lamps." A. W. RIMINGTON. June 3rd. (Complete.)

13,502. "Improvements in and relating to the driving of dynamo-electric machinery." ART.-GES., BROWN, BOVERI ET CIE. (Date applied for under Sec. 91 of the Act, June 22nd, 1909, being date of application in Switzerland.) June 3rd. (Complete.)

13,518. "Improvements in arc light electrodes." BRITISH THOMSON-HOUSTON Co., LTD. (General Electric Co., United States.) June 3rd.

13,519. "Improvements in fittings for electric lamps." BRITISH THOMSON-HOUSTON Co., LTD. (General Electric Co., United States.) June 3rd.

13,520. "Improvements in and relating to controlling devices for electric circuits." BRITISH THOMSON-HOUSTON Co., LTD. (General Electric Co., United States.) June 3rd. (Complete.)

13,521. "Improvements in and relating to electric motor-control systems." BRITISH THOMSON HOUSTON Co., LTD. (General Electric Co., United States.) (Complete.)

13,535. "Improvements in electro-magnets and armatures." I. H. PARSONS and A. E. J. BALL. June 4th.

13,538. "Improvements in arc lamps." H. E. MOUL. June 4th.

13,535. "Improvements in and connected with arc lamps." W. R. RIDINGS. June 4th.

13,572. "Improvements in starting switches for electric motors." A. H. CURTIS, A. H. MACKLEY and ADAMS MANUFACTURING Co., LTD. June 4th.

13,589. "Manufacture of an improved bent lever for interrupters such as are used in connection with ignition devices in internal-combustion engines." Firm ROBERT BOSCH. (Date applied for under Sec. 91 of the Act, February 4th, 1910, being date of application in Germany.) June 4th. (Complete.)

PUBLISHED SPECIFICATIONS.

Copies of any of the Specifications in the following list may be obtained of MESSRS. W. P. THOMPSON & Co., 285, High Holborn, W.C., and at Liverpool and Bradford; price, post free, 9d. (in stamps).

1909.

DYNAMOS AND MOTORS. E. Turner. 2,959. February 8th.

ELECTRICAL TRANSMISSION OF POWER AND SPEED REGULATION FOR AUTOMOBILES, ROAD OR RAIL TRAMS, LOCOMOTIVES, HAULING, HOISTING, WINDING GEAR AND THE LIKE. W. P. Durtnall. 6,768. March 20th.

STARTING OF ELECTRIC MOTORS. W. D. Kilroy and Evershed & Vignoles, Ltd. 10,680. May 5th.

ELECTRIC SWITCHES. C. P. Elieson. 10,757. May 6th.

JUNCTION BOXES FOR ELECTRIC WIRES AND CABLES. S. W. Martyn. 10,880. May 7th.

ELECTRIC HEATING DEVICES. British Thomson-Houston Co. (General Electric Co.) 11,172. May 11th.

PROCESS OF AND APPARATUS FOR USE IN DISTRIBUTING ELECTRICITY. E. W. Lucas and W. Walmsley. 11,201. May 12th.

ELECTRICAL TRANSMISSION OF SIGNALS AND THE LIKE. H. C. Leake. 11,295. May 12th.

ELECTRIC CONTROLLERS FOR RAILWAY SERVICE AND THE LIKE. T. von Zweigbergk. 11,302. May 12th.

ELECTRIC CONTROLLERS. T. von Zweigbergk. 11,303. May 12th.

PREPAYMENT ELECTRICITY METERS. W. N. Goddard. 11,402. May 14th.

ELECTRIC ARC LAMPS. W. J. Davy. 11,482. May 14th.

RECTIFYING APPARATUS FOR ELECTRIC CURRENTS. British Thomson-Houston Co. (General Electric Co.) 11,539. May 15th.

ELECTRIC METERS. British Thomson-Houston Co. and F. Holden. 12,680. May 29th.

CONTACT FINGER FOR ELECTRICAL CONTROLLERS AND SWITCHES. R. C. Lyness. 15,151. June 29th.

ELECTRIC ARC LAMPS. Siemens-Schuckertwerke Ges. 16,904. July 19th. (Application for Patent of Addition to No. 15,605/09.)

ELECTRIC ARC LAMPS. R. Szubert. 22,926. October 7th.

TRANSMITTING APPARATUS FOR ELECTRIC SIGNALLING. P. O. Pedersen. 25,190. November 2nd.

BURGLAR ALARMS AND SWITCH DEVICES. R. D. Lichtenfeld. 28,942. December 10th.

ELECTRODES FOR ELECTRIC ARC LAMPS. H. C Gravius. 29,739. December 14th. (Date applied for under International Convention, July 1st, 1909.)

1910.

TELEPHONE EXCHANGES. Siemens Bros. & Co. (Siemens & Halske Akt.-Ges.) 8,118. February 8th.

DRIVING OF MAGNETO-ELECTRIC MACHINES FOR STARTING INTERNAL-COMBUSTION ENGINES. L. L. Bellem and G. J. Bregeras. 6,962. March 19th. (Date applied for under International Convention, March 25th, 1909.)

APPARATUS FOR AUTOMATICALLY RECORDING INTERVALS OF TIME BETWEEN THE PASSAGE OF TRAINS ON A TRACK AND THE SPEED OF THE TRAINS. Siemens and Halske Akt.-Ges. 576. January 6th. (Date applied for under International Convention, March 25th, 1909.)

ELECTROLYTIC MANUFACTURE OF SALTS OF HEAVY METALS WHICH ARE INSOLUBLE OR HARDLY SOLUBLE IN THE ELECTROLYTE. C. Luckow. 408. January 6th.

TELEPHONE RECEIVERS. Siemens Bros. & Co. and C. R. Riber. 466. January 7th.

BOXES FOR SWITCHES OR OTHER ACCESSORIES USED ON ELECTRIC LIGHTING, HEATING OR POWER CIRCUITS. A. P. Lundberg, G. C. Lundberg and P. A. Lundberg. 3,926. February 17th.

DISTRIBUTION OF ELECTRIC ENERGY. A. E. Tanner and E. A. Claremont. 7,019. March 31st. (Date applied for under Rule 18, April 8th, 1909.)

ELECTROMAGNETIC DEVICES FOR CONTROLLING THE ADMISSION OF CARBURETTING LIQUID TO INTERNAL-COMBUSTION ENGINES. L. L. Bellem and G. J. Bregeras. 9,496. April 19th. (Date applied for under International Convention, April 24th, 1909.)

The British Westinghouse Electric and Mfg. Co., Ltd.

MANCHESTER AND LONDON.

Head Office and Works:—TRAFFORD PARK, MANCHESTER. *Registered Offices:*—NORFOLK ST., STRAND, LONDON, W.C.

GAS ENGINES

(Photo 5908)

Four-cylinder vertical tandem enclosed Westinghouse Gas Engine, direct-coupled to Westinghouse Alternating-current Generator (specially mounted on combined bedplate).

Westinghouse Gas Engines aggregating 50,000 b.h.p. already installed in Great Britain alone.

KEEP FOR REFERENCE.

The British Westinghouse Electric & Mfg. Co., Ltd.

The Advantages of the Westinghouse Vertical Tandem Gas Engine

EFFICIENCY.—Low gas consumption.

FLOOR SPACE.—Compact design allows a maximum power to be installed in given space.

TURNING MOMENT.—The cyclic regularity is equal to best high-class steam engine, enabling alternators to be driven in parallel with perfect success.

FUEL.—Town, producer, blast furnace, coke-oven, or retort gas.

RELIABILITY.—Equal to steam installations.

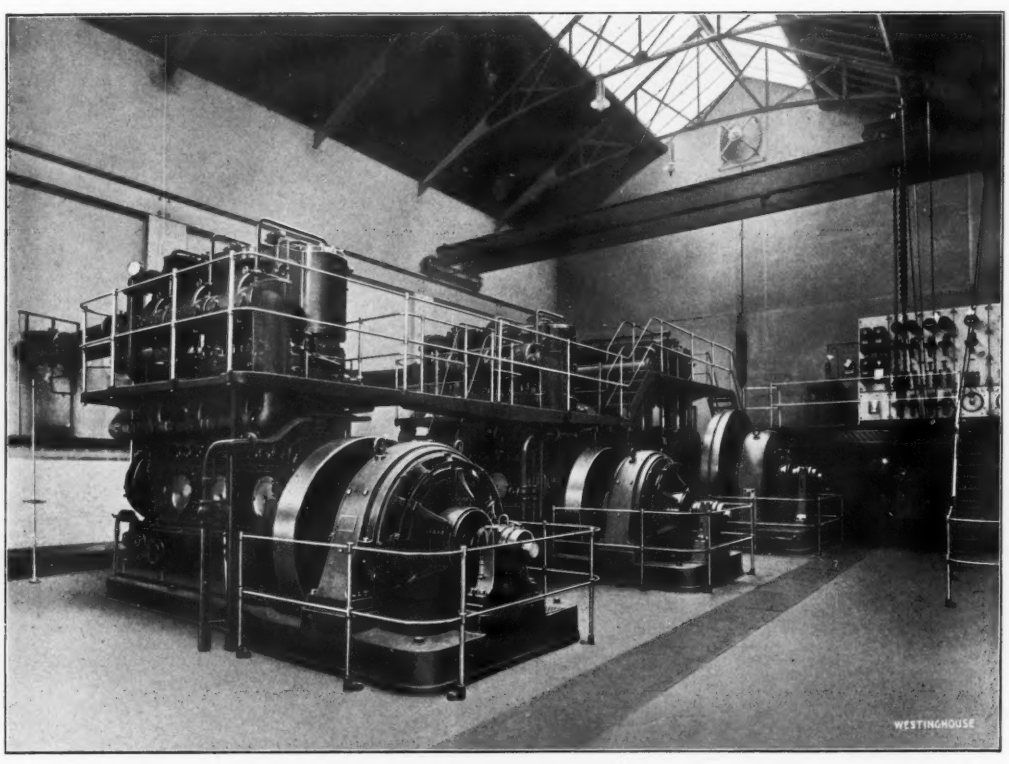
MAINTENANCE.—As low as best class of steam engine.

RATING.—Quoted rating is continuous and not maximum.

ADAPTABILITY.—Can be used for a.-c. or d.-c. generator work with direct *solid* coupling for rope driving textile mills, belt or rope driving, or direct coupling to shafting, and for industrial work of all kinds.

EASY STARTING.—No half compression cams or similar devices to operate. Starting torque is equal to the full load torque. No friction clutches or other mechanism required to ease the load at starting.

Typical Installations

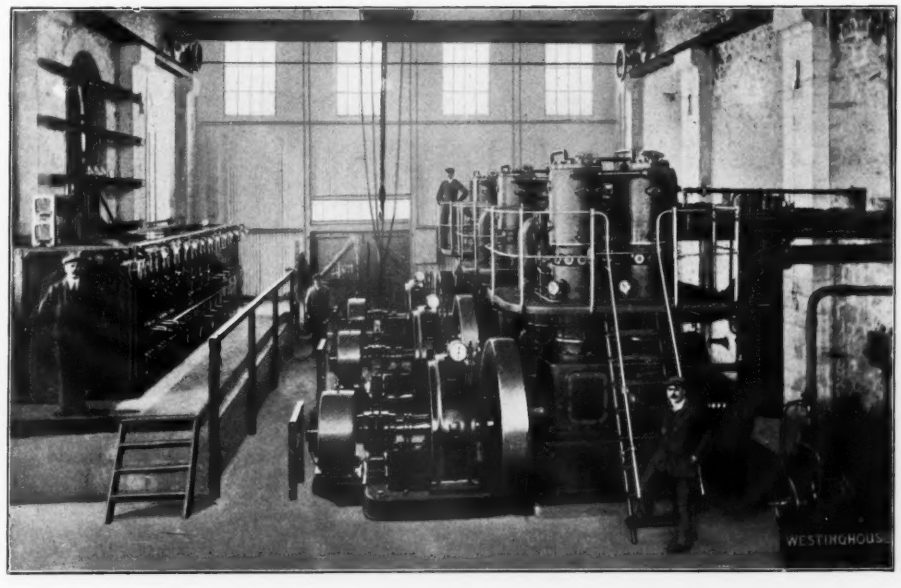


(Photo B7940.)

Westinghouse Tandem Gas Engines, 6-cylinder,—installed at Birmingham Small Arms Works.

The British Westinghouse Electric & Mfg. Co., Ltd.

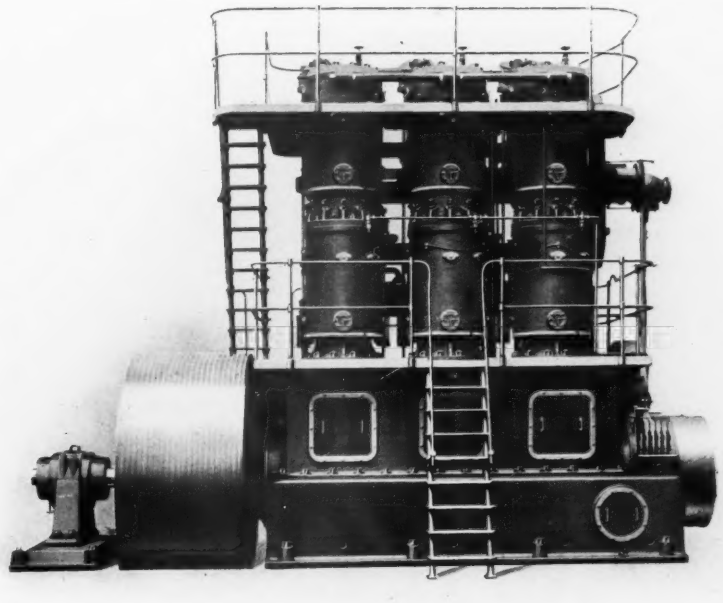
Typical Installations—continued.



(Photo 33112.)

Interior of Power House at a Cornish Mine.

The sets consist of three two-crank, four-cylinder, 300-r.p.m. Westinghouse tandem type engines, coupled direct to 165-kw., three-phase, 50 period, 440 volt, alternating-current generators and exciters. The whole equipment of the Power House is of Westinghouse manufacture.



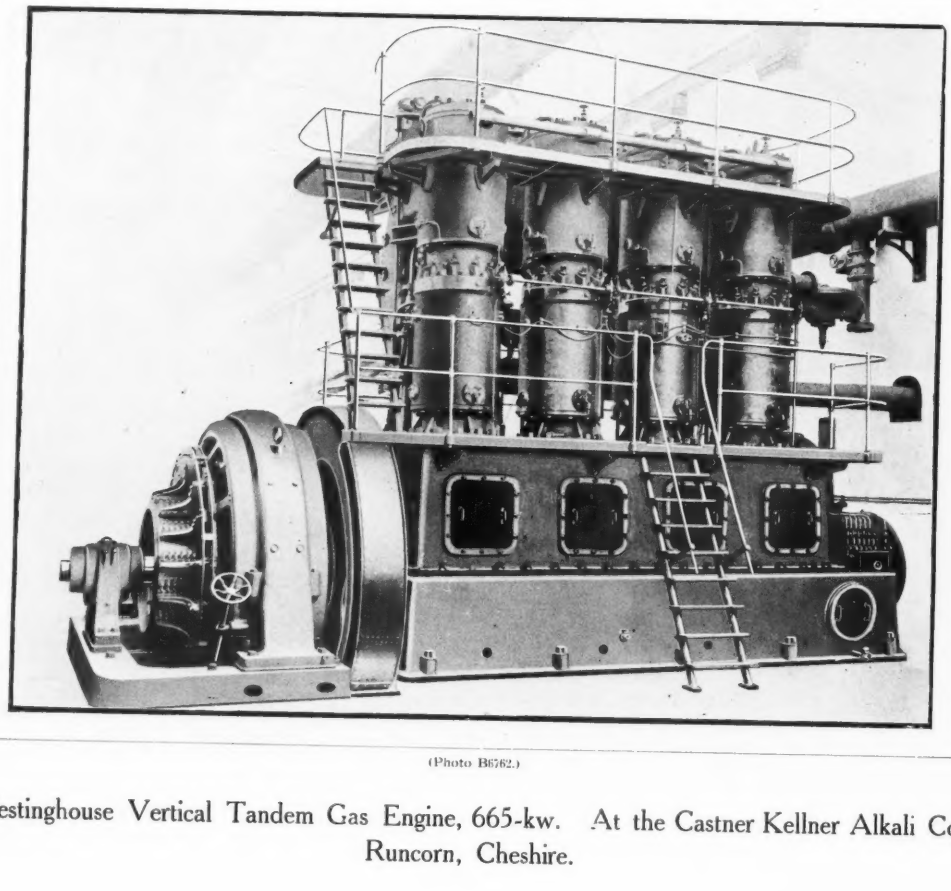
(Photo B6149A.)

Westinghouse Tandem Gas Engine, 6-cylinder vertical, 750-hp.

This engine drives Hollins Textile Mill, nr. Manchester, being roped to the mill shafting as in typical steam practice.

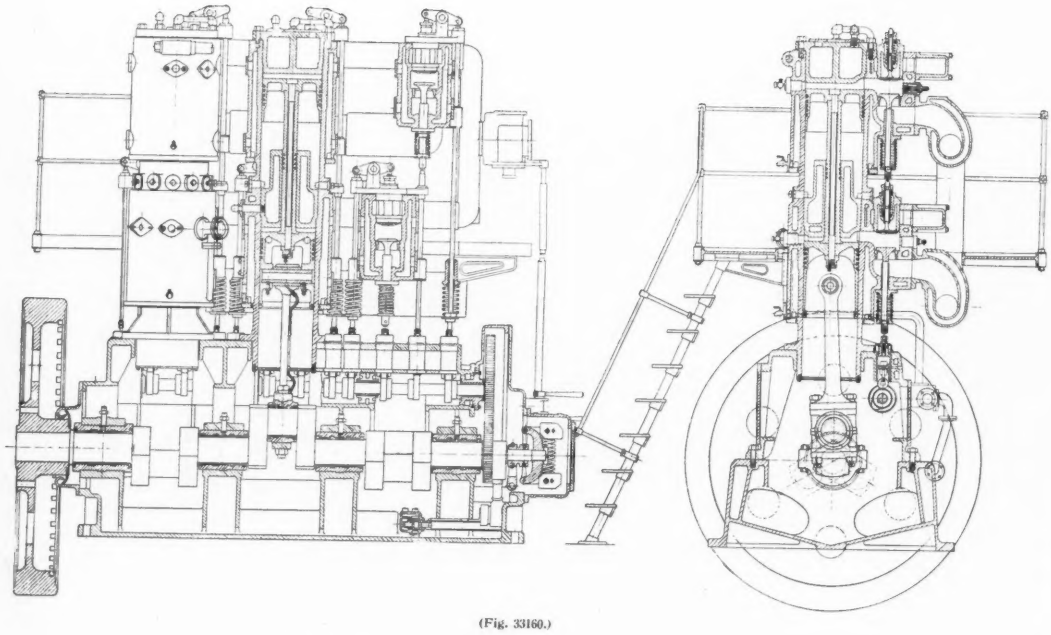
The British Westinghouse Electric & Mfg. Co., Ltd.

Typical Installations—continued.



(Photo B6762.)

Westinghouse Vertical Tandem Gas Engine, 665-kw. At the Castner Kellner Alkali Co., Runcorn, Cheshire.



(Fig. 33160.)

Typical Section of Westinghouse Tandem Engine.

Printed by WILLIAM CATE, LTD., Hogarth House, Bouverie Street, E.C., and Published by the Proprietors, H. ALABASTER GATEHOUSE & CO., at 4, Ludgate Hill, London.